The IUCN Species Survival Commission

African Elephant Database 1998

R. F. W. Barnes, G. C. Craig, H. T. Dublin, G. Overton, W. Simons and C. R. Thouless

Occasional Paper of the IUCN Species Survival Commission No. 22

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The Department of the Environment Transport and the Regions (DETR), UK supports a Red List Officer post at the SSC Centre in Cambridge, UK, where the SSC Trade Programme staff are also located. Together with two other Government-funded agencies, Scottish Natural Heritage and the Royal Botanic Gardens, Kew, the DETR is also financing a specialist plants officer. Further support for the centre is being offered by two NGO members of IUCN: the World Wide Fund for Nature - UK, and Conservation International, US.

UNEP-GRID until mid-1998 hosted the African Elephant Database and provided logistic support in the framework of technical collaboration.

The United States Fish and Wildlife Service (USFWS) generously provided funds for purchasing equipment and software for running the African Elephant Database project, producing the update and publishing this report.

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African Elephant Specialist Group
Species Survival Commission
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in collaboration with

Global Resources Information Database
United Nations Environment Programme

Occasional Paper of the IUCN Species Survival Commission No. 22

IUCN – The World Conservation Union
1999

Published by: IUCN, Gland, Switzerland and Cambridge, UK

Citation: Barnes, R.F.W., Craig, G.C., Dublin, H.T., Overton, G., Simons, W. and Thouless, C.R. (1999). *African Antelope Database 1998*. IUCN/SSC African Elephant Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. x + 250pp.

ISBN: 2-8317-0492-8

Cover photo: The Systematic Reconnaissance Flight method of counting elephants – Part of a herd of over 600 elephants (*Loxodonta africana*) in Garamba National Park, Democratic Republic of Congo, April 1993, taken during a systematic sample count. The rods on the wing struts of the aircraft delineate the strip widths for the count. *Kes Hillman Smith*

Cover design: IUCN Publications Services Unit

Produced by: IUCN/SSC/African Elephant Specialist Group

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ACKNOWLEDGEMENTS

The preparation of this update would not have been possible without the voluntary contributions of both AfESG members and non-members, who provided information and data for this publication at the AfESG meeting in 1998 and through questionnaire replies and personal communications. We would especially like to thank the following: D. Balfour, J. Bizimana, A. Blom, O. Burnham, B. Chardonnet, Y. Demeke, B. Donnie, R. East, A. Ekobo, M. Enock, F. Fischer, M. Garai, J. A. Hart, I. Hashim, A. Kane, D. Kouamé, M. Maige, F. Michelmore, C. Moss, S. Munthali, G. Muriuki, P. Omondi, J.R. Ononanga, J.M. Pavy, S. Sagnah, L. Saiwana, M. Tchamba, J. Tello, P. Walsh, L.J. White, I. Whyte, S. Williams, P. Winter, J. Waithaka, and B. Won wa Musiti. Our thanks also go to Monica Buyu for cheerful secretarial assistance throughout the project.

EXECUTIVE SUMMARY

The *African Elephant Database 1998* (Barnes *et al.,*1999) is a comprehensive overview of numbers and distribution of the African elephant (*Loxodonta africana*), published by IUCN in its *Occasional Paper* series. Based on a GIS-database maintained by the IUCN/SSC/African Elephant Specialist Group (AfESG) in Nairobi, Kenya, it updates the *African Elephant Database 1995 (*Said *et al.*, 1995) with information collected during the years 1995 to 1998. Data for 37 countries from four regions of the African continent (Central, Eastern, Southern and West) are displayed in the form of text, tables of estimates, and GIS-generated maps showing elephant range, protected areas and major geographical features. The country and regional data contribute to the overall continental data which are also summarised on maps and tables. All the source material is referenced and an introductory section details the background and structure of the database, the methodology used for counting elephants, and the criteria for determining the reliability and quality of data.

Over the centuries the range of the African elephant has shrunk and become fragmented, most noticeably in West Africa. Of the 37 remaining countries with African elephant populations, about one-third harbour less than 10,000 individuals, often in scattered populations. There is considerable variation from country to country in data reliability and quality, for several reasons. For example, many range states are experiencing political strife or economic difficulties and thus lack the resources to conduct regular wildlife surveys. Vast areas of elephant range are forested, particularly in Central Africa, where elephants are counted by indirect dung count methods and results from relatively small survey zones are extrapolated to much larger areas. Countries with savannah elephant populations tend to be mainly in Southern and Eastern Africa, where elephants can be counted more accurately from the air. Even in these regions, however, several range states are not able to produce regular updates of numbers and range.

Because of this variation in data quality, it is inappropriate to summarise all estimates into one continental total. This is why the authors decided to categorise the estimates according to the quality and reliability of the data received, into four distinct groups based on criteria drawn up by the AfESG's Data Review Taskforce. Thus for every country and region, and ultimately for the continent itself, elephant estimates are expressed as Definite, Probable, Possible and Speculative. These mutually exclusive categories can be interpreted simply to mean that in any given country there are "definitely" (w) number of elephants, "probably" (w + x) number of elephants, "possibly" (w + x + y) number of elephants and "speculatively" (w + x + y + z) number of elephants. The categorisation provides a basis for addition at least within categories and enables the reader to discern the quality of data in a particular country at a glance. It provides the stimulus for improving the accuracy of data collection, and highlights areas for further improvement and analyses.

The *African Elephant Database 1998* is an objective representation of the status of the African elephant today. The GIS approach provides a valuable overview which enables individual populations to be seen in a continental perspective.

ISBN: 2-8317-0492-8

Hard copies of this publication can be ordered from:

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INTRODUCTION

HISTORICAL BACKGROUND

The African elephant (*Loxodonta africana*) is the largest living land mammal. The species once inhabited most of the continent, from the Mediterranean coast down to its southern tip (Cumming *et al*., 1990). By the Roman era there were no more elephants in north Africa (Scullard, 1974) and the picture of elephant range today is one of scattered, fragmented populations south of the Sahara Desert.

Historically, the continental decline of the African elephant population and the contraction of its range are associated with the ivory trade over several centuries, coupled with human population expansion and desertification (Cumming *et al*., 1990). It has been speculated that elephant population decline since the 19th century was linked to both the ivory trade and habitat loss, but since 1979 up to the late 1980s was mainly attributable to illegal hunting of elephants for ivory (Milner-Gulland and Beddington, 1993a, 1993b).

During the 1970s and 1980s there was increasing public concern for the fate of the African elephant but data were lacking to support the speculations of serious population decline. It became essential to organise information to verify the situation. Systematic attempts to estimate Africa's elephant population can be traced back to 1976, when the African Elephant Survey and Conservation Programme was implemented. Information on elephant range, numbers and trends was compiled from questionnaires and survey data (Douglas-Hamilton, 1977-1979). Under the same programme, a concurrent study of the ivory trade was carried out on behalf of the United States Fish and Wildlife Service (USFWS) (Douglas-Hamilton, 1979; Parker, 1979). The programme publicised major declines in elephant populations in many African countries during the 1970s. The available information was reviewed by the African Elephant Specialist Group (AfESG) of the Species Survival Commission (SSC) of IUCN in a 1980 meeting in Nairobi, Kenya and again, along with additional questionnaire responses, in 1981 in Hwange, Zimbabwe (Cumming & Jackson, 1984). In 1987, at an African Elephant and Rhino Specialist Group (AERSG) meeting in Nyeri, Kenya, data from AERSG questionnaires as well as the preliminary results from the database project of Burrill and Douglas-Hamilton (1987), were used to produce population estimates (Cumming *et al*., 1990). The comparison of estimates suggested that elephant populations had more than halved in several areas between the years 1981 and 1987 (Cumming *et al*., 1990).

In 1989 the African elephant was placed on Appendix I of the Convention of International Trade in Endangered Flora and Fauna (CITES). The ruling was effected in 1990, meaning that no elephant products could be traded internationally among Parties to the Convention. However, most governments in southern Africa's elephant range states did not support the Appendix I listing, arguing that elephant populations in their countries were stable or increasing, largely due to good management, and that the apparent continental decline in elephant numbers was not indicative of local trends. This led to division between those for and against the trade ban, which in turn disrupted the activities of the AERSG until the early 1990s. Public interest in the fate of the African elephant remained high and the species retained an Appendix I CITES listing between 1990 and 1996, with unsuccessful proposals to downlist specific populations, primarily in southern Africa.

In June 1997, at the 10th meeting of the Conference of the Parties to CITES (COP10), a decision was made to transfer the African elephant populations of Botswana, Namibia, and Zimbabwe from CITES Appendix I to Appendix II and to allow limited commercial trade in raw ivory from these countries to Japan in 1999.

Partly as a result of the controversy which surrounds the question of trade in ivory, there is a persistent desire for regular updates on the status of elephant populations, particularly at the continental level. However, because of a number of limitations which are outlined below, the production of a continental total is difficult and can be inherently misleading. Most information on elephant numbers on the continent has been guesswork and has not formed a suitable basis from which to determine population trends over time, or to discern the effects of policy

or management. In fact, data conducive to trend analysis are only available from a few key populations and performing such analyses on other populations is inappropriate and may provide spurious results. In this update of the African Elephant Database (AED), further attempts have been made to improve upon the 1995 update (Said *et al.*, 1995) and to produce a continental overview which more accurately reflects the variety in data quality.

REASONS TO COLLECT DATA ON ELEPHANT RANGE AND NUMBERS

Information on elephant range and numbers is vital for the effective conservation and management of Africa's remaining elephants. There are biological, economic and socio-political reasons for counting elephants. More than ever, wildlife management authorities are being asked whether elephant numbers are increasing or decreasing and whether elephant populations should be controlled to reduce conflict and to relax the pressure on habitats. The elephant is a "keystone" species, playing a pivotal role in structuring both plant and animal communities (Shoshani, 1993) and dominating the biomass in the habitats it occupies (White, 1994). The impact of the African elephant on its habitat can be both beneficial (Chapman *et al.*, 1992; Ruggiero and Fay, 1994) and destructive, especially on trees, when high densities of elephants build up in confined areas (Craig, 1993a; Tchamba and Mahamat, 1992; Swanepoel, 1993; Höft and Höft, 1993). It is pertinent to ask how large a protected area should be to conserve a certain biological diversity, or, more specifically, to support a viable elephant population (Armbruster and Lande, 1993); this in turn points to the need to define a minimum viable population for elephant conservation (Sukumar, 1993).

Non-protected areas constitute the majority of elephant range and national wildlife authorities are faced with the issue of management outside national parks and reserves as well as within. There is more conflict between man and elephants, especially in agricultural areas which were formally uninhabited by humans, presenting a difficult challenge to conservationists (Kangwana, 1995). Thus there is clearly a need for defined management objectives for both protected and non-protected areas of elephant range (Lindsay, 1993; Lindeque, 1995), which cannot be drawn up without accurate information on elephant distribution and numbers.

THE NEED FOR A CONTINENTAL APPROACH

The status of the African elephant varies significantly across its range, and the long-term survival of individual populations is more threatened in some countries than in others. While the desire to conserve elephants is widespread, opinion differs as to how this goal should be achieved. However, it is difficult to make objective decisions about elephant management and conservation within and beyond protected areas without the sort of overview that a synthesis of continent-wide information can provide.

Continent-wide information is required because elephants migrate long distances across protected area boundaries and international boundaries and a policy or management decision made in one country can affect cross-border elephant populations as well as remote populations in other countries. Policies concerned with ivory management and trade, in particular, transcend political boundaries drawn on a map. Trading by one country may affect poaching or smuggling in others, or one country may fear that trading in another may affect poaching and smuggling within its borders. Changing land-use patterns, different approaches to tourism and trophy hunting between neighbouring states and any policy decisions which directly or indirectly lead to fluctuations in the price of ivory, are all factors which can ultimately affect the future of the continent's elephant population. Furthermore, civil and international wars often lead to the mass migration of refugees into previously uninhabited areas of elephant range. Some of the more important range states which are currently experiencing conflict have little or no monitoring capabilities. These factors all make it difficult to partition elephant management into political units. While regional initiatives, such as the ELESMAP programme which involved most southern African range states (Craig, 1996), are necessary to census and manage shared, cross-border populations, a continental perspective is also important.

THE AFRICAN ELEPHANT DATABASE

The African Elephant Database (AED) is a computerised information system which stores population estimates and associated geographic information for the African elephant, *Loxodonta africana*.

Iain Douglas-Hamilton initiated the AED in 1986 against a background of claims of serious population decline in specific areas of the continent. The objective of the project was to develop a comprehensive picture of elephant numbers and distribution throughout Africa. Using data accumulated from questionnaire replies, surveys and interviews - mostly from members of the AERSG - a database of elephant population estimates and distribution was assembled (Burrill and Douglas-Hamilton, 1987). Data were stored in a Geographic Information System (GIS), which is a database management system especially designed for the management of large amounts of spacially referenced environmental information. Burrough (1986) defines GIS as *a powerful set of tools for collecting, storing, retrieving, transforming and displaying spatial data from the real world for a set of particular purposes.* In many respects GIS programmes are similar to non-geographic computer programmes. They share the ability to accept, process and present data, to update and modify and to combine data sets originating from different sources. ARC/INFO is the GIS software used for the AED.

From its inception until April 1998, the AED was housed at the United Nations Environment Programme (UNEP) headquarters in Nairobi, in collaboration with UNEP's Global Environment Monitoring System (GEMS) and the Global Resource Information Database (GRID). In April 1998 the AED was moved from its location at UNEP to its present location within the offices of the African Elephant Specialist Group (AfESG).

The initial activity of the project was to plot all the data of elephant distribution on maps for the first time, and to analyse the factors most closely associated with elephant density. Of all the variables used in the analysis (vegetation, protected areas, human population, socio-economic and political factors, rainfall, tsetse fly distribution) the strongest positive correlation, which was statistically significant, was between elephant density and effective protection of a given area (Burrill and Douglas-Hamilton, 1987). The data for elephant range and estimates were updated again in 1992, both in computerised and published form (Douglas-Hamilton *et al*., 1992).

Towards the end of 1992, the AED became the direct responsibility of the AfESG, now a separate group from the African Rhino Specialist Group (AfRSG). At an AfESG meeting in November 1992, a Data Review Taskforce (DRTF), consisting of five members, was appointed to review issues related to the future structure and management of the AED and to define other data needs of the AfESG. Two DRTF meetings were convened in 1993, during which discussions were held on the restructuring, role and potential uses of the AED (IUCN/SSC/AfESG Taskforce, 1993). In late 1993, a GIS consultant was employed to try out recommendations made by the DRTF for data input and data quality categorisation, and to make further suggestions on the future use and management of the AED (Beardsley, 1993).

Building on the consultant's report, an AED manager was employed to develop and update the database. Said and Chunge (1994) produced a preliminary report for limited circulation at the CITES meeting in November 1994, which was then revised to produce the 1995 update (Said *et al.*, 1995). Funds were received from the USFWS to continue the activities of the AED until the end of 1999. A full-time database manager was hired, and activities continued, under the guidance of the DRTF, to refine and improve the structure of the database.

Three initiatives of the DRTF are now underway with the aim of enhancing the effectiveness of the AED as an analytical tool in the conservation and management of the African elephant. The first is to investigate various measurable factors involved in human-elephant conflict, for example human density and land-use patterns, and to develop a model to predict where conflict is likely to occur. Countries where the human-elephant conflict dynamic is best understood, and where the conflict zones are best defined, have been chosen for the initial analysis. As the model becomes refined, it is hoped that the AfESG, through the AED, can provide an early warning system, predicting the location of future human-elephant conflict sites in any range state, thus helping wildlife management authorities to avert conflict before it occurs.

A second, but equally important model under development, will attempt to establish the relationship between elephant density and variables such as land protective status, geology, rainfall, and human population. Such a model could be put to two important uses: (1) it could be used to predict the likely effects of human population growth and settlement on elephant numbers and distribution into the next century; (2) it could generate estimates of expected elephant densities, from which elephant numbers can be extrapolated, in areas which have not been surveyed

Thirdly, the DRTF is developing a new data collection system for improving estimates of elephant range. As noted below, range data for elephant populations can be extremely problematic. The new range data system will place a grid (quarter- or half-degree) over a map of the continent and collect information on elephant sightings or signs.

It is hoped that the AED will serve as a model for other large mammal databases, as well as benefiting with input from existing databases such as human density, land-use patterns and forest cover. With time, the database should be able to provide information for the setting of priorities at a supra-national level, by establishing significant positive and negative population trends and attributing them to given causes. The AED is only one of many single-species databases and there is a need, currently being prioritised by IUCN, to consolidate information on animal and plant species and build up a central database service for a wide range of users all over the world.

TYPES OF DATA COLLECTED FOR THE AED

Data are collected on two basic variables: distribution or **range**, and **numbers**. There are two subspecies of the African elephant, *Loxodonta africana africana*, or the savanna elephant, and *Loxodonta africana cyclotis*, the forest elephant. Recent genetic studies indicate that forest elephants are sufficiently distinct to warrant independent conservation status (Georgiadis *et al.*, [1994]). However, no distinction is made between the two subspecies in this publication because information was neither requested nor compiled at a subspecies level.

Elephant range

Defining elephant range
Elephant range is broadly defined by the AfESG as the entire area where the species occurs in the wild at any time.

The AfESG attempted to classify range further as: **core** range where elephants are present throughout the year; **seasonal** range where elephants are present seasonally; and e**rratic** range where elephants occur periodically, but not every year. A **situation unknown** category was also defined, to account for areas where elephants are known to occur but there is insufficient information to state which of the previous three categories applies (Anon., 1993).

In reality it is very difficult to define range (because of the scarcity of animals at its edge), to collect precise information about range or to monitor changes in range, especially over large areas of Africa that are covered with dense forest. Techniques of radio and satellite tracking to follow the movements of individual elephants are proving useful (Lindeque and Lindeque, 1991; Thouless, 1997) in determining precise movements but their application is limited by the expense and expertise required.

Limitations of data on elephant range
Range information for a particular country is often updated by a single representative at an AfESG meeting or by an individual answering a questionnaire. Trying to draw a precise range boundary on maps of varying quality and scale is often an arbitrary exercise and can actually degrade the database. Neat, rounded lines may be indicative of scanty knowledge in comparison to the fragmented, more detailed pictures which emerge from countries with comprehensive information, or for which more than one person has returned a questionnaire. In some countries, national range is extrapolated from a small survey area. Range often fits, albeit too precisely, the exact boundaries of protected areas, because that is where most surveys are carried out. This means that movements in and out of protected areas, or between protected areas and surrounding dispersal areas, are largely ignored. Alternatively, range is delimited on a map by a natural boundary such as a river or a mountain range,

for convenience rather than accuracy. When range information in one country extends to a national boundary, it does not always match the range in its neighbouring country because of non-response or poor information. Such abrupt demarcations of range between countries are seen between, for example, the Democratic Republic of Congo (DRC) and the Central African Republic (CAR), DRC and Congo, Equatorial Guinea and Cameroon, Cameroon and CAR and Sudan with Kenya and Uganda.

Ideal information on range is thus difficult to obtain throughout most of the continent and therefore no attempt has been made to distinguish between different categories of range for this update, although this issue remains open for discussion and review. The DRTF chose to retain the existing broad definition of range i.e. *the entire area in which the species occurs in the wild*, in this update of the AED.

Elephant numbers

Methods to count elephants

There is no ideal method for counting elephants. Each has its advantages and disadvantages and is applicable in a different situation. It is not the intention here to describe the different methods in any detail. The reader is referred to Norton-Griffiths (1978); Barnes and Jensen (1987); Barnes (1993); Douglas-Hamilton *et al*. (1992); Craig (1993b); and Kangwana (1996).

Methods for estimating elephant numbers fall into three categories: **total counts, sample counts and guesses.** The aim of a total count is to see and record all the elephants in a defined area. A total count may be conducted from the air or from the ground. Aerial counts are conducted from fixed-wing aircraft or helicopters and are only suitable when elephants are not hidden by forest or thick bush. Aerial surveys are commonly used in savanna habitats, especially in eastern and southern Africa.

Total counts of a limited area can be conducted at ground level by teams in vehicles or on foot. These are uncommon in Africa, but sometimes used in India when the observers ride on domesticated elephants.

In a handful of places, total ground counts have been accomplished by identifying every individual in the population. This is only possible for intensively studied populations where animals can be observed readily.

During a sample count only part of the area (anything between 3% and 20%) is counted, usually along transects. The transects may be randomly distributed or evenly placed across the area. The resulting data are used to calculate the population estimate and confidence limits. Sample counts are often made from the air in eastern and southern Africa, but they may also be made on the ground, either on foot or from vehicles. In forests it is difficult to see elephants and so indirect sample methods are used. Elephant dung is counted along transects and the results are combined with estimates of elephant defecation rate and dung decay to provide a population estimate with confidence limits. Dung counting techniques are evolving rapidly in the same way that aerial counting methods evolved in the 1960s and 1970s.

Organising an elephant survey, whether a total or sample count, whether from the air or on the ground, requires a considerable investment in manpower, equipment, time and money. In many cases this is not possible and we have to rely on guesses made by people who know the area in question. If they provide some information which allows one to judge the accuracy of their estimate, e.g. a survey estimate with little or no details of methodology, then the estimate is considered an **informed guess**. If no such information accompanies the estimate, or if an estimate is older than 10 years old, then it is considered as an **other guess**.

Limitations of data on elephant numbers

The quality of data is limited by a number of factors. These include the suitability of a chosen survey technique, the inherent biases of each technique, and other sources of bias, such as observer skill and variability, limited financial resources, lack of proper equipment, poorly trained staff, weather conditions, vegetative cover and incorrect application of technique. Ideally, data on elephants in any country should be collected by a wildlife management authority using qualified staff and standardised methods for collecting, recording and analysing data. In reality, elephant data are collected by a multiplicity of agencies and individuals, often without any direct linkage to one another and by using a variety of different techniques based on current opinion and available resources. The result is a collection of variable data in a few countries and no data at all from many populations.

Very few countries have the means, either financially or in the form of expertise, to conduct systematic surveys on a regular basis. Furthermore, political strife plagues many range states.

Elephants are often found in unprotected areas where few surveys are undertaken. In some countries, elephants inhabit a mixture of terrain and it is necessary to combine aerial and ground survey data to calculate a national estimate. Data derived from site-specific dung surveys form the basis of extrapolated estimates in vast areas of elephant range in the thick, equatorial forests of central Africa. In fact most national forest population estimates are extrapolated from dung surveys carried out in relatively small areas of forest. Seasonal movements of elephants and the occurrence of cross-border populations are additional factors which potentially lead to inaccurate national estimates. As yet there has been limited cross-border survey work to determine the uniformity of such populations. Instead they are treated as separate populations on either side of the border, which occasionally may result in a degree of double counting. Joint survey work in areas of southern and eastern Africa has been initiated in recognition of this problem.

DATABASE MANAGEMENT

The AED can be thought of as a collection of data, which is used to generate new information in the form of maps and tables. However, the data within the AED are not static, and periodic updates form an essential aspect of the management of the database. Otherwise, any products derived from the database will quickly become obsolete and irrelevant to the potential user.

The process of updating the database begins with the collation of survey data from the field in a manner suitable for input into the AED. This is mainly accomplished through questionnaires, interviews with relevant persons and literature searches, and is the responsibility of the AfESG Secretariat and the AED manager. The collation of survey data is followed by a selection process, which determines which data are suitable to replace or augment the existing data in the AED. After new data are entered into the AED a number of data management procedures are performed before producing the updated maps and tables.

The appearance of the maps and tables in this document is essentially unchanged from the previous report (Said *et al*., 1995). For clarity, some changes have been made to data presentation, by altering column headings and map layouts. The most notable change to the country maps is the addition of a grid with coordinates for geographic reference. Major rivers have also been added to the maps. A significant change applies to the definition of a protected area in the AED: the maps now display **only** those protected areas which are in IUCN Management Category I, II, III, IV or V and fall within estimated elephant range. Coding systems for both protected areas and survey zones have been simplified, while unique codes for different areas have been retained.

DATA COLLATION

This publication contains updates which were made available to the AfESG during 1996, 1997 and 1998, but where no updates were available, estimates and range information from Said *et al*. (1995) have been retained. However, data older than ten years old have been removed or downgraded to other guesses (see DATA CATEGORISATION).

Questionnaires were distributed in 1997 and 1998 to all AfESG members and other individuals with possible access to reliable information on elephant populations and distribution. At the AfESG meeting in 1998, individual participants from all countries present met with the database manager to provide updates. Other data were assembled from published and unpublished literature, and through personal communications.

Factors which limit data collation

The AfESG can neither control the degree of compliance for questionnaire responses, nor can it always verify the responses. It was not possible to obtain questionnaire replies from every country and not all African elephant range states were represented at the AfESG meeting in 1998.

Datasets from the Africa Data Sampler CD-ROM have been used to improve the AED datasets on country boundaries, roads, rivers and lakes, towns and protected areas. However, it was established that the data had errors and needed additional processing. For this update, the questionnaires were accompanied by A2-size geo-referenced maps as published in the 1995 update. However, for many respondents it remained difficult to update boundaries of protected areas, survey zones and elephant range, due to the small scale of the maps and the limited detail of displayed physical features.

DATABASE DESIGN

The AED is a continental database of medium scale (± 1: 1 million), and its main aim is to collect, store, maintain and publish information on protected areas, elephant population surveys and elephant range. These themes are projected onto a base-map derived from the 1995 Africa Data Sampler CD-ROM (a geo-referenced database produced by the World Resources Institute [USA] in collaboration with the World Conservation Monitoring Centre [UK]) that contains the following physical features for reference: political boundaries, major

towns, major roads, major rivers and lakes. The AED contains both spatial and non-spatial or attribute data, which are managed by GIS-software and a relational Database Management System (DBMS). The logical contents have evolved slightly over the last update period, and it should be noted that the data displayed in this report are a sub-set of the AED contents, although the most crucial data are shown. The structure of the database has changed drastically since the AED was moved to a PC platform under Windows 95. The various spatial data layers are now in PC ARC/INFO format, while the survey details are stored in an MS Access database. The above mentioned software is used for database development and management, while another software-package, ArcView, is used for cartographic map production. Reports or output tables from Access and layouts or maps from ArcView can be easily transferred to a Windows-based word-processor or DTP-package for the purpose of publication.

DATA INPUT

Information for the AED is received both in digital and paper format (maps, reports, communications and questionnaires). Digital data are converted to the required AED format through various conversion routines. Paper maps are digitised, while attribute data from reports, communications and questionnaire replies are entered through the keyboard. After data input, spatial data are geo-referenced and stored in geographic coordinates, as polygons, lines and points according to geographic feature type. New data are conflated with existing data and boundaries are adjusted to rivers, lakes, and political boundaries of the base-map. Unique identifiers are assigned to each instance (polygon or record) of survey zone, protected area and elephant range, so as to maintain the integrity of the database. Hence, polygon areas are calculated in square kilometres through projection into Lambert Azimuthal Equal Area. This projection is used since it retains the size property of areas and is suitable for the whole African continent.

DATA ANALYSIS

With the updates in place a number of procedures are performed that generate new information from the existing data. Each survey is categorised according to survey type and in some cases the availability of 95% confidence limits. Hence, a set of objective rules is used to determine data quality, survey reliability, and to calculate the number of **Definite**, **Probable**, **Possible** and **Speculative** elephants (see DATA CATEGORISATION). The calculation of **Definite, Probable, Possible** and **Speculative** number of elephants is repeated at the country, regional and continental level after pooling the variances of individual surveys and recalculation of 95% confidence limits.

The areas of survey zone, protected area and elephant range as calculated by the GIS are aggregated at national level to determine the total size of elephant range, protected areas and survey zones. In addition overlay capabilities of the GIS are used to determine percentages of both protected and surveyed elephant range. Percentages have to be treated with caution since these are relative figures which may be sensitive to even small inaccuracies.

OUTPUT OF DATA

The maps for this update are presented as two themes. The first map of each region or country shows elephant range in relation to the protected areas. The second map displays elephant range in relation to survey zones. Each survey zone is assigned an estimate. Each map feature, for example, the type of protected area, has a code, which (for the purpose of clarity) has been presented as a three-digit code.

Each country is accompanied by two tables with the exception of three: Congo, Sudan and Sierra Leone, from which no estimates were available. The first table provides information on individual survey estimates while the second summarises the individual estimates into four exclusive groups, **Definite, Probable, Possible** and **Speculative** numbers of elephants.

Accompanying each table and map for every range state is a brief written overview which relates to the elephant data and is intended to supplement the information provided by the map and/or table. It is not the intention to provide the reader with exhaustive information or an historical account of each country but simply to clarify the current situation and to highlight any factors which have contributed to it. The overview provides a basic

description of the conservation situation for elephants, beginning with general statistics of country area, area of elephant range, protected area coverage, amount of elephant range which falls within the given protected areas, and the amount of range which has been surveyed or has elephant population estimates. Only the IUCN protected area categories I through V were included. While many important management areas for elephants fall outside these five categories, they are difficult to distinguish across Africa and were not included in this update. Elephant range, population data and cross-border movements are also discussed in each country overview, to provide the reader with a basic understanding of how elephant range was determined, which areas have been surveyed, when and how, and how the data have been interpreted. Lastly, broad issues affecting elephant conservation, such as political conflict, tourism, wildlife management, land-use and poaching, are discussed briefly.

UPDATES SINCE THE 1995 PUBLICATION

For several countries, comprehensive updates on numbers have not been possible because of political strife or total lack of resources. For some countries, only corrections to existing estimates were received. In other countries, updates have only been received for a small portion, or sub-populations, of previously recorded populations. Even if a sub-population has been surveyed accurately and in great detail, it represents only a fraction of a much larger population, which, for the purpose of calculating a national estimate, may be, at best, an extrapolated estimate.

Post-1995 updates or corrections to existing data for elephant populations and/or range, either nationally or in individual populations, were obtained for 30 of the 37 range states. Those updated, either in terms of numbers or range, or both, include:

Central Africa Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea, Gabon.

Eastern Africa Eritrea, Ethiopia, Kenya, Rwanda, Tanzania, Uganda

Southern Africa Botswana, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.

West Africa Benin, Burkina Faso, Ghana, Guinea, Ivory Coast, Mali, Niger, Nigeria, Senegal, Togo.

The remaining range states (Congo, Somalia, Sudan, Angola, Guinea Bissau, Liberia, and Sierra Leone) produced no updates. It is important to note that changes in national estimates do not necessarily reflect true population change assessed by recent updates; more often, improvement in survey techniques leads to better estimates or new estimates being produced in areas both previously surveyed and unsurveyed. New estimates for some unsurveyed areas are based on informed guesswork. For over one-third of the range states, the estimates are derived mainly from guesswork.

The reader is advised not to make comparisons or trend assumptions between country, regional or continental estimates in this report and in the 1995 report, because differences between the two may not reflect real differences but rather improvements and corrections to the data and to the database.

DATA CATEGORISATION

Survey data in the AED are categorised according to data quality and survey reliability. The use of a data quality category establishes the general quality of the data within surveys which use the same methodology. For instance, the data quality of an aerial sample count is based on its sampling intensity, which determines whether the survey is of high or low quality. The category of survey reliability helps to determine how reliable a population estimate is. Survey reliability in turn determines the breakdown of the population estimate into **Definite, Probable, Possible** and S**peculative** numbers of elephants.

DATA QUALITY

Ground survey data

For **ground sample counts**, *sampling intensity* is considered to be the best measure of quality. The following quality categories are based on percentage sampling intensity of a given area:

1. Greater than 20%
2. 5% to 20%
3. Less than 5%, or not reported.

Ground total counts, including counts in which individuals are all registered, are given a data quality of 1.

Aerial survey data

For **aerial sample counts**, *sampling intensity* is considered to be the best measure of quality. The following quality categories are based on percentage sampling intensity:

1. Greater than 20%
2. 5% to 20%
3. Less than 5%, or not reported.

With respect to **aerial total counts**, data quality has been categorised in terms of *searching rates*, as follows:

1. Less than 100 km^2/hr
2. 100 - 200 km^2/hr
3. More than 200 km^2/hr, or not reported

Dung counts

1. CLS* for mean elephant density less than 30% and one of the following:

(a) Decay rate measured on site for $\geq$50 dung-piles
(b) Defecation rate measured on site
(c) CLS for dung density estimate $\leq$20%
(d) Sampling done for both wet and dry seasons

OR Any three of the above four conditions in (a)-(d).

2. CLS for elephant density $\leq$50%

OR Any two out of the three following conditions:

(a) Decay rate measures on site for $\geq$30 dung-piles
(b) Defecation rate measured on site
(c) CLS for dung density $\leq$30%

3. When the conditions for (1) and (2) are not fulfilled.

* CLS are 95% confidence limits expressed as a percentage of the mean.

Guesses

Both **informed guesses** and **other guesses** are given a data quality category of 3.

SURVEY RELIABILITY

Survey reliability is rated from A (highest) to E (lowest). The first criterion used for determining survey reliability is the type or method of survey. An additional criterion used for aerial and ground sample counts and dung counts is the availability of 95% confidence limits as an indicator of survey accuracy. Survey types considered in this report are listed below:

Total Counts
- Aerial total count
- Ground total count
- Individual registration

Sample Counts
- Aerial sample count
- Ground sample count
- Dung count

Guesses
- Informed guess
- Other guess

The rating of these survey types in terms of reliability is as follows:

Survey reliability	**Survey type(s)**
A	Aerial total counts, ground total counts and individual registrations
B	Aerial sample counts and ground sample counts with 95% confidence limits
C	Dung counts with 95% confidence limits
D	Aerial sample counts, ground sample counts and dung counts without 95% confidence limits, and informed guesses
E	Other guesses

ELEPHANT NUMBERS

The national, regional, and continental totals produced in this update are displayed as **Definite, Probable, Possible** and **Speculative** numbers of elephants, rather than as single figures with an attached range.

The summation of elephant population estimates into national, regional and continental totals is essentially misleading because it takes no account of the variety in data accuracy and reliability. The addition of estimates derived from surveys which range from accurate total counts to guesswork is strictly invalid. During the last update in 1995 it was decided to place individual population estimates into different groups, to better reflect the quality of estimates derived from different types of surveys. Thus, if different data types cannot legitimately be combined into a valid continental estimate, at least it becomes possible to obtain totals for a few separate categories. As a result, four exclusive groups of elephant estimates were created.

They are:

1. **Definite**
2. **Probable**
3. **Possible**
4. **Speculative**

These divide the population estimates into four distinct groups of decreasing quality. Estimates from the following five categories of survey types, A, B, C, D and E, contribute to the four groups as follows:

A. Aerial total counts (AT), ground total counts (GT) and individual registrations (IR)

1. **Definite** = the population estimate
2. **Probable** = none
3. **Possible** = none
4. **Speculative** = none

Example: Kruger National Park, South Africa.

The area was surveyed by an aerial total count and 8,869 elephants were counted. Thus the population estimate is placed in the **Definite** group.

In this example therefore, there are "definitely" as many as 8,869 elephants present.

B. Sample aerial counts (AS) and ground sample counts (GS) with 95% confidence limits

1. **Definite** = the lower 95% confidence limit of the population estimate (there are at least this number of elephants) or the number actually seen, whichever is greater
2. **Probable** = the difference* between the estimate and the lower confidence limit or between the estimate and the actual number seen or between the estimate and zero, if the lower confidence limit is a negative**
3. **Possible** = the difference* between the upper confidence limit and the estimate.
4. **Speculative** = none

* Rounded to the nearest whole number if necessary

** If the lower confidence limit of the estimate is a minus figure, the **Definite** estimate will be zero, or the actual number of elephants seen.

Example: Ruaha-Rungwe Ecosystem, Tanzania.

The area was surveyed by an aerial sample count and an estimate of 13,021 ± 4,300 (± 95% confidence limits) elephants was given. The lower 95% confidence limit of the population estimate is placed in the **Definite** group. In this example this equals 8,721 (13,021 - 4,300). The difference between the lower 95% confidence limit (8,721) and the estimate itself is placed in the **Probable** group (13,021 - 8,721 = 4,300) while the difference between the upper 95% confidence limit and the estimate is placed in the **Possible** group (17,321 - 13,021 = 4,300).

Thus, in Ruaha-Rungwe, it can be concluded that there are "definitely" 8,721 elephants, "probably" 4,300 more than this, and "possibly" an additional 4,300 (i.e. "possibly" as many as 8,721 + 4,300 + 4,300).

For an aerial sample count the **Probable** estimate will always equal the **Possible** estimate provided that the confidence limits are symmetrical about the mean. However, if the lower confidence limit of the estimate is less than zero or the actual number seen, the **Possible** estimate will be greater than the **Probable** (e.g. Etosha National Park, Namibia).

C. Dung counts (DC) with 95% confidence limits

1. **Definite** = none*
2. **Probable** = the population estimate
3. **Possible** = the difference between the upper confidence limit and the estimate
4. **Speculative** = nil

* It is assumed that there are no "definite" elephants because no elephants are observed directly and while aerial surveys will almost always be undercounts, the same does not apply to dung counts, where a change in parameters such as forest area, decay rate, or the mathematical model used, may change the estimate either upwards or downwards.

Example: Kahuzi-Biega, Democratic Republic of Congo.

The area was surveyed by dung counts and an estimate of 3,720 ± 1,350 elephants was given. The population estimate (3,720) is the **Probable** figure while the difference between the upper confidence limit of the estimate (3,720 + 1,350 = 5,070) and the estimate itself (5,070 - 3,720 = 1,350) is the **Possible** figure.

Thus, in Kahuzi-Biega, it can be concluded that there are "probably" 3,720 and "possibly" another 1,350 more.

D. Sample aerial counts (AS), ground sample counts (GS) and dung counts (DC) without 95% confidence limits, and informed guesses

An informed guess is one where either the person giving it has a good knowledge of the area, or else has given an accurate description of the process by which the guess was derived. This includes aerial sample surveys, ground sample surveys or dung counts where no range or confidence limits are given or details of methods are not documented. Extrapolations based on a sufficient amount of ground survey work are also considered as informed guesses.

1. **Definite** = the number actually seen, if given
2. **Probable** = none
3. **Possible** = the population estimate or the lower estimate if a range is given, minus the actual number seen, if given
4. **Speculative** = the difference between upper and lower estimates, if given

Example: Northeastern Ghana

The estimate of 100 to 150 elephants is based on fieldwork carried out in the area. A total of 22 elephants have actually been seen. Because the estimate was "informed" but not based on a systematic survey, it is categorised as an informed guess. In this case the actual number seen, 22, is placed in the **Definite** group, the difference between the lower estimate and the actual number seen (100 - 22 = 78), is placed in the **Possible** group while the difference between the upper (150) estimate and the lower is classified as Speculative i.e. 50.

Thus, in Northeastern Ghana, there are " definitely" 22 elephants, "possibly" 78 elephants and "speculatively" another 50.

E. Other guesses (OG)

Other guesses include estimates for which there is no indication of how accurate they might be e.g. the estimate came from a casual visitor to an area or simply from hearsay. Data are also classified as other guesses where there are grounds for supposing that they might be very inaccurate or unreliable, for example, stimates that are older than 10 years and estimates in countries that have suffered a breakdown in central government since the estimate was provided, even if the estimate was based on an actual survey. The latter is the case for estimates from Angola, and Liberia. Extrapolations with limited ground-truthing or no statement of the model's assumptions are also included as other guesses.

1. **Definite** = the number actually seen, if given
2. **Probable** = none
3. **Possible** = none
4. **Speculative** = the estimate, or if given, the mean of the upper and lower limit, minus the actual number seen, if given

Example: Krahn Bassa National Forest, Liberia.

The estimate for Krahn Bassa National Forest is 495, but it can no longer be considered reliable due to the prolonged civil strife since the estimate was made in 1990. It is therefore classified as an other guess. Therefore, "speculatively", there are 495 elephants in Krahn Bassa National Forest.

READING THE TABLES AND MAPS

NATIONAL TABLES

The first table presented for each country provides information on individual elephant population estimates. The following parameters are displayed:

CODE = the three-digit code which identifies the area in the AED.
The codes in the update denote the following:

101 - 199	Protected areas
201 - 299	Unprotected areas, including areas for which the IUCN Management Category is unknown, unassigned, or equal to or greater than VI
301 –399	Areas that are partly protected and partly unprotected, e.g. ecosystem surveys

SURVEY ZONE = the name of the area surveyed followed by its legal designation, e.g. Queen Elizabeth National Park.

SURVEY YEAR = the year of survey, or in case of guesswork , the year to which the guess applies.

AREA = the size of the area in **km^2**. Where available this area indicates the area reported by the reference source. If unreported, the area was either derived from the size of the protected areas that comprised the survey, or was calculated from the GIS, rounding off to the nearest fivefold. The projection used for area calculation was Lambert Azimuthal Equal area projection, which is best suited for area calculations in Africa (Beardsley, 1993).

NUMBER OF ELEPHANTS = the individual **ESTIMATE** from a given survey with **95% CONFIDENCE LIMITS** (or range limits) where applicable and the **DENSITY** of the elephant population (**no/km^2**).

SOURCE = the report, questionnaire reply or personal communication from which the estimate came. Each source is referenced.

SURVEY TYPE & QUALITY = The type of survey carried out and its assigned quality, 1,2 or 3, (see DATA CATEGORISATION). The abbreviations for each survey type are explained above each table.

SURVEY RELIABILITY = The category, A, B, C, D or E, into which the elephant estimate falls, which is dependent on the survey type and additional criteria described above (see DATA CATEGORISATION). The summation of the estimates in each category is used to create the second table.

The second table summarises the information contained in the first by placing the overall **NUMBERS OF ELEPHANTS** for a country into four groups, **DEFINITE, PROBABLE, POSSIBLE** and **SPECULATIVE**, based on the five categories of **SURVEY RELIABILITY A to E**.

It is important to note that the totals presented for each country are minimum estimates, based on the estimates for the areas that have been censused in that country. Areas of elephant range that have not been censused are not included in these totals. If all of the elephant range is listed, then the totals are national estimates. However, if, for example, estimates are given of forest elephants in particular sites which account for only a small proportion of the elephant range in the forest zone (e.g. Cameroon), the total cannot be considered a national estimate.

NATIONAL MAPS

The first map presented for each country shows the location of the protected areas in relation to the elephant range. The protected areas are grouped to the national legal designation, i.e. National Park, or Wildlife Reserve. Each protected area is assigned a 3-digit code that links the area on the map to its description in the text. The areas are numbered sequentially from 101 onwards, with 101 assigned to the protected area in the most northern position. Each map displays the major roads, rivers, lakes, and towns of the country for physical reference and is overlayed with a grid of geographic coordinates for geographic reference.

The second map presented for each country shows the location of the survey zones in relation to the elephant range. Each survey zone has a unique 3-digit code that links the area on the map to the map legend. The text information on the survey zones is sorted on code, and besides code lists name and population estimate. Since the first digit of the code identifies the protection status of the survey zone, the sorted list shows protected, unprotected and combined survey zones respectively. Each of the sub-lists is ordered on latitude, with the first occurrence in the most northern position. Each map again displays the major roads, rivers, lakes, and towns of the country for physical reference and is overlayed with a grid of geographic coordinates for geographic reference.

NATIONAL, REGIONAL AND CONTINENTAL SUMMARY TABLES

For each of the four regions, a summary table is presented displaying total national estimates and overall regional estimates as **Definite**, **Probable**, **Possible** and **Speculative** numbers of elephants. The regional summaries are totaled to produce the continental summary of estimates, also as **Definite**, **Probable**, **Possible** and **Speculative** numbers of elephants. For national, regional and continental summaries, the **Definite** (w), **Probable** (x), **Possible** (y) and **Speculative** (z) totals are exclusive. Thus, for a country, a region or the whole continent, there are, simply speaking, "definitely" (w) number of elephants, "probably" (w + x) number of elephants, "possibly" (w + x + y) number of elephants and "speculatively" (w + x + y + z) number of elephants.

Note that the confidence interval of the overall total of several sample counts from different areas is obtained by pooling the variances from the individual estimates (Norton-Griffiths, 1978). At all levels of addition of these estimates i.e. national, regional and continental levels, the variances are pooled before addition of the estimates to the four groups, **Definite, Probable Possible** and **Speculative**. This is why the regional group totals are not always the sum of the national group subtotals, and likewise, the continental totals of **Definite, Probable, Possible** and **Speculative** numbers of elephants are not always the simple sum of the regional group subtotals.

No attempt has been made to analyse or interpret past or future trends of elephant populations at the local, national, regional or continental level, as there are few places with comparable estimates collected over a long time. It is expected that as overall data quality improves, it will be possible to combine more of the estimates legitimately, so that ultimately the division of population estimates into categories will fall away.

CONTINENTAL OVERVIEW

CONTINENTAL OVERVIEW

Sub-Saharan African countries have witnessed considerable change over the past few years and the majority are experiencing difficult times. Civil wars and inter-nation conflict has broken out or continued in 11 of the 37 range states, economies are in recession and corruption is increasing. According to the World Bank (1998), between 1985 and 1995 the GNP per capita has declined in sub-Saharan Africa by 1.1% per annum, and only seven range states had a positive GNP growth rate during that time period. Almost all sub-Saharan African economies are classified as low income, except for Namibia, Swaziland and Equatorial Guinea which are lower middle income, and Botswana, Gabon and South Africa which are upper middle income (World Bank, 1998). Declining economic conditions can only lead to fewer resources becoming available for elephant conservation, as range states focus their remaining capital on other human development activities.

Among the most critical problems facing elephant conservation are the lack of financial resources and growing human populations. Expanding agricultural activites increasingly cause degradation and destruction of elephant habitat. This is most evident in West Africa, which is almost identical in size with the other regions (Figure 1), but has the most fragmented elephant range with only 4% of the region being considered to be elephant range (Figure2). Further examination of range shows that while over 40% of elephant range for Africa (2,772,397 km^2) can be found in Central Africa (Figure 2 and 3), this region also has the lowest percentage (10%) of protected range. Conversely, West Africa has the smallest area of elephant range (212,463km^2), but almost 40% (82,992 km^2) is protected.

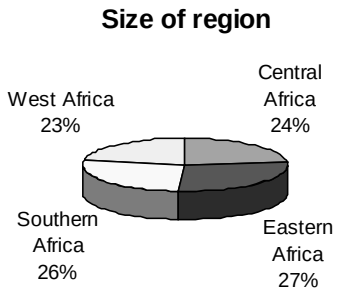


Figure 1. Comparative size of each region.

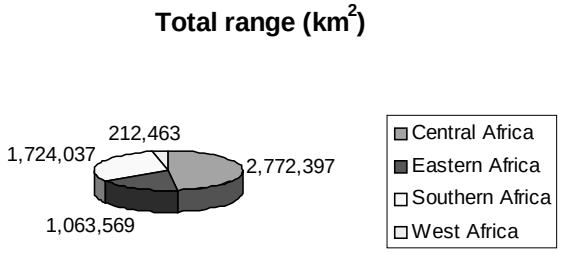


Figure 2. Amount of elephant range in sub-saharan Africa per region.

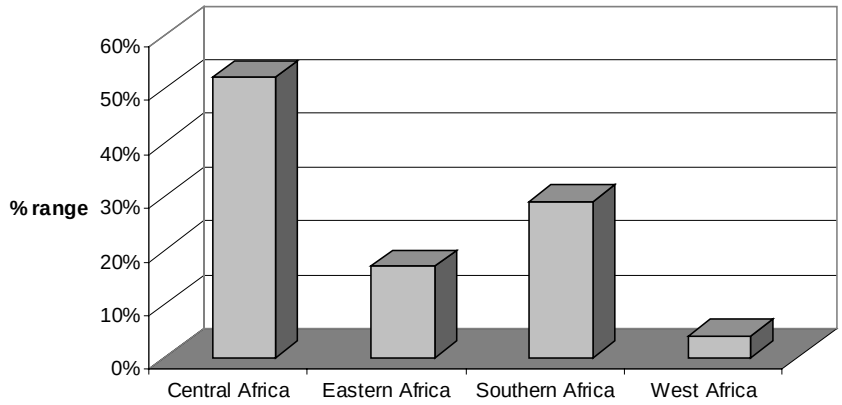


Figure 3. Percentage of elephant range in sub-saharan Africa per region.

Most populations in the **Definite** category are found in Southern and Eastern Africa. There are major differences in the distribution of estimates across categories between Eastern and Southern Africa on the one hand, and West and Central Africa on the other (Figure 4). These differences are mostly due to the differences in habitats (forest and savanna), and therefore in survey methodology (see Categorisation of Data Quality), between regions. There is a very large difference between savanna and forest habitats in the proportion of **Definites** (Figure 5). This explains the low number of **Definite** estimates for Central Africa, which is largely forest habitat. The high proportion of **Possible** and **Speculative** estimates for Central Africa highlights the need to improve estimates for this region because they may account for a large percentage of the remaining elephants on the continent.

While it is not recommended to make direct comparisons between the overall continental estimates provided in Said *et al.* (1995) and the current database, for the reasons outlined in the introductory section, it is noteworthy that the total number of elephants in the **Definite** category has increased, even though the **Probable** and **Possible** estimates have decreased. This is mostly a reflection of more accurate aerial survey estimates in some countries, especially in Southern Africa. On the other hand, the total removal of estimates from Congo, and the downgrading of other estimates e.g. in Gabon, have reduced the total estimates in the **Probable** and **Possible** categories while those in the **Speculative** category have increased.

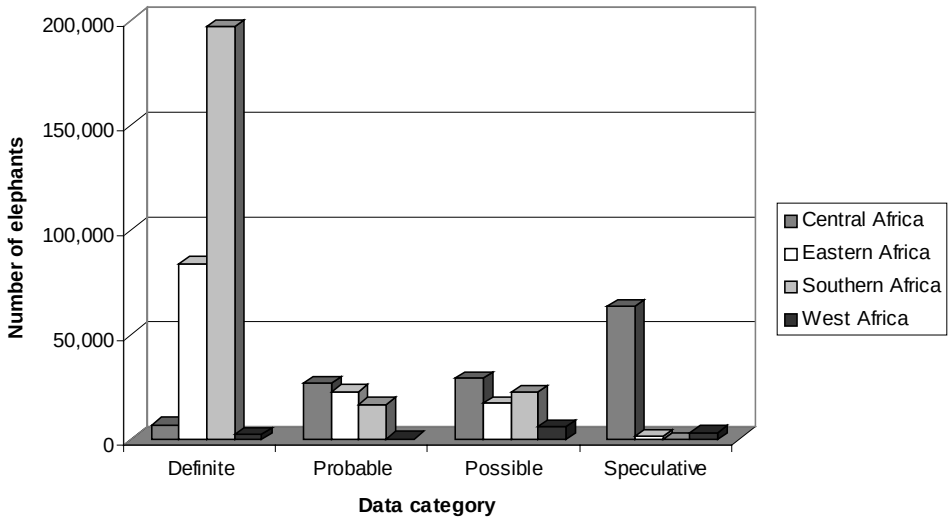


Figure 4. Elephant estimates by category per region.

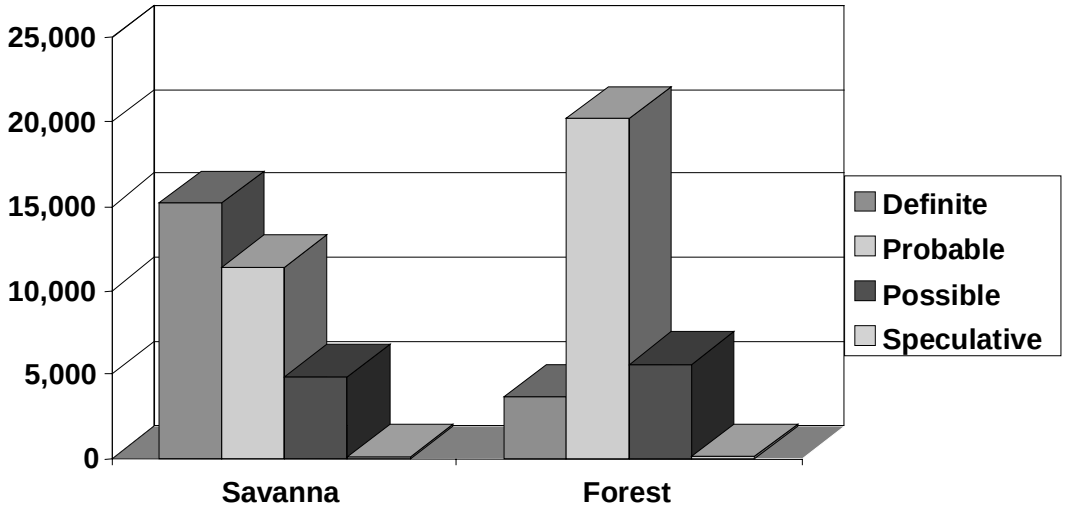


Figure 5. Elephant estimates by category in savanna and forest habitats.

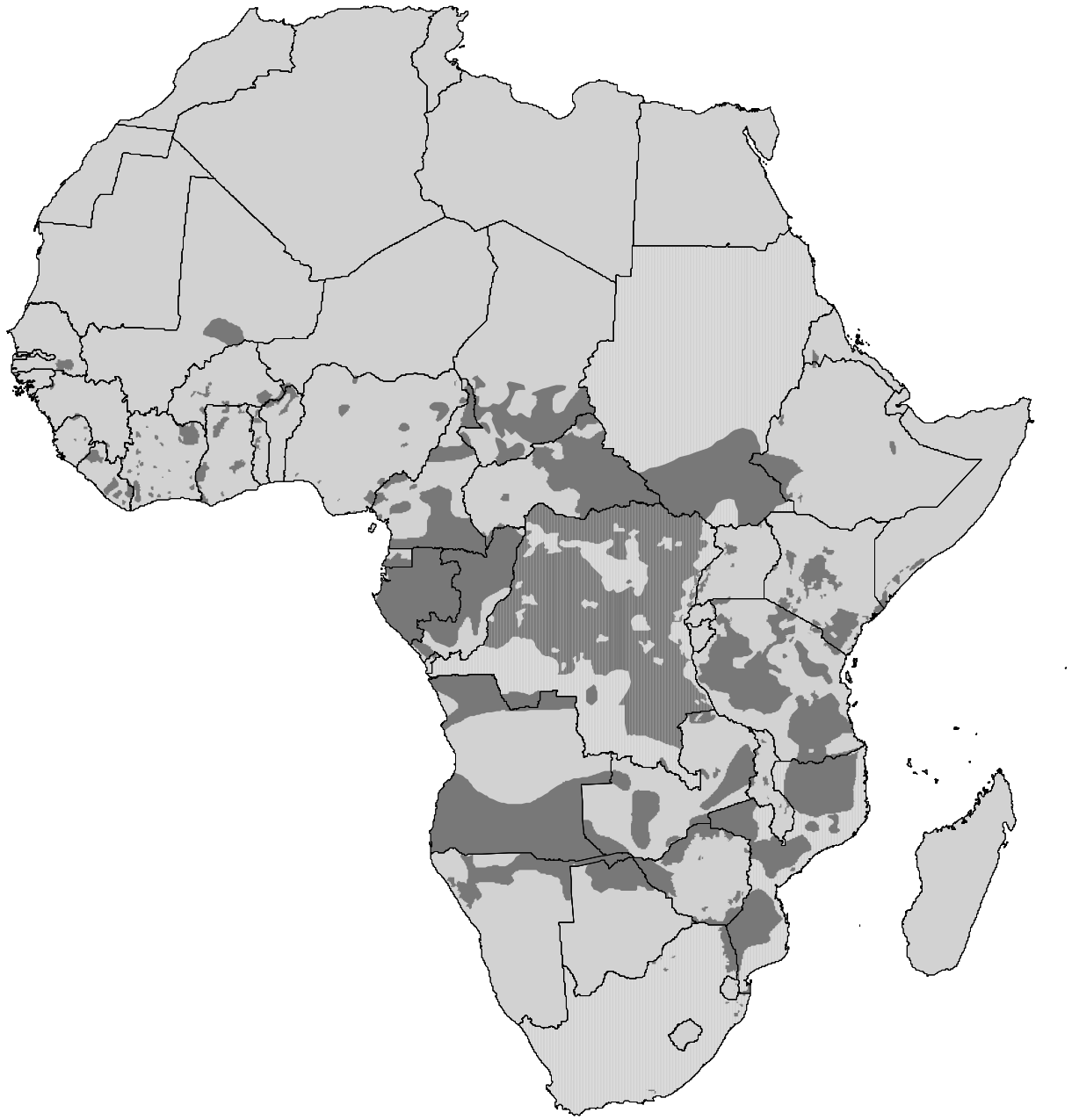
SUMMARY OF ELEPHANT ESTIMATES ON THE CONTINENT

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
CENTRAL AFRICA	Cameroon	1,071	5,285	8,704	675	475,440	229,195
	Central African Republic	2,515	1,600	6,605	8,000	622,980	314,274
	Chad	0	0	1,600	300	1,284,000	219,130
	Congo	0	0	0	0	342,000	255,373
	Democratic Republic of Congo	3,736	20,219	5,618	120	2,345,410	1,476,560
	Equatorial Guinea	0	0	0	80	28,050	14,559
	Gabon	0	0	7,500	54,294	267,670	263,306
	TOTAL	**7,322**	**27,104**	**27,613**	**63,469**	**5,365,550**	**2,772,397**
EASTERN AFRICA	Eritrea	2	0	0	0	121,320	2,967
	Ethiopia	321	0	0	985	1,127,127	59,717
	Kenya	14,364	11,350	4,882	100	582,650	112,988
	Rwanda	39	0	20	10	26,340	1,019
	Somalia	0	0	130	120	637,660	11,783
	Sudan	0	0	0	0	2,505,810	404,908
	Tanzania	67,416	12,196	12,078	0	945,090	458,315
	Uganda	215	565	1,662	280	236,040	11,872
	TOTAL	**83,770**	**22,698**	**17,216**	**1,495**	**6,182,037**	**1,063,569**

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
SOUTHERN AFRICA	Angola	0	0	0	170	1,246,700	678,785
	Botswana	76,644	13,414	13,414	0	600,370	81,486
	Malawi	647	1,569	1,649	20	118,480	7,968
	Mozambique	6,898	1,946	4,496	0	801,590	467,062
	Namibia	6,263	1,421	1,421	0	825,418	145,015
	South Africa	11,905	0	0	0	1,219,912	25,847
	Swaziland	39	0	0	0	17,360	188
	Zambia	15,873	6,179	6,964	0	752,610	208,123
	Zimbabwe	63,070	8,034	10,185	0	390,580	109,563
	TOTAL	**196,845**	**17,057**	**22,623**	**190**	**5,973,020**	**1,724,037**

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
WEST AFRICA	Benin	0	0	400	0	112,620	13,036
	Burkina Faso	1,616	606	1,486	0	274,200	18,198
	Ghana	476	218	1,185	443	238,540	30,202
	Guinea	0	0	108	140	245,860	2,277
	Guinea Bissau	0	0	0	35	36,120	331
	Ivory Coast	51	0	495	645	322,460	35,543
	Liberia	0	0	0	1,783	111,370	22,003
	Mali	0	0	950	50	1,240,000	37,024
	Niger	0	0	817	100	1,267,00	2,694
	Nigeria	157	0	860	236	923,770	34,383
	Senegal	9	0	11	10	196,190	8,428
	Sierra Leone	0	0	0	0	71,740	2,914
	Togo	0	0	96	0	56,790	5,430
TOTAL		**2,489**	**644**	**6,228**	**3,442**	**5,096,660**	**212,463**
TOTAL CONTINENTAL ESTIMATES		**301,773**	**56,196**	**60,780**	**68,596**	**22,617,267**	**5,772,466**

ELEPHANT RANGE IN AFRICA



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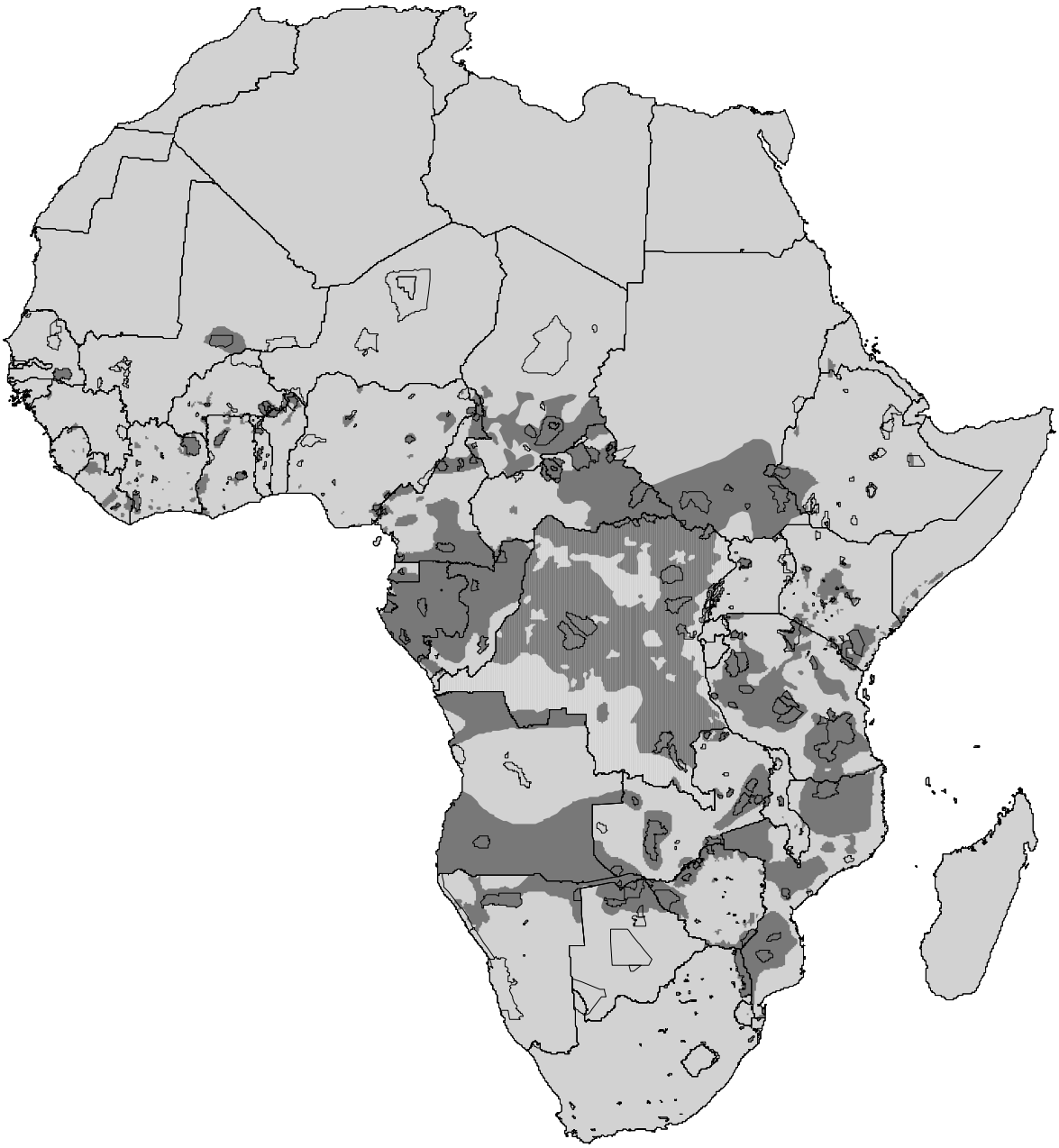
PROTECTED AREAS AND ELEPHANT RANGE IN AFRICA



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CENTRAL AFRICA

CENTRAL AFRICA

Central Africa harbours the largest expanses of forest elephant range on the continent, possibly covering almost half the region (Figure 2) and including six countries: Cameroon, Central African Republic (CAR), Congo, Democratic Republic of Congo (DRC), Equatorial Guinea and Gabon. Smaller savanna elephant populations reside in Chad, northwest CAR and Garamba National Park in DRC. Due to the inherent difficulties of surveying forest elephant populations, a sizeable percentage of elephant estimates in the region are classified as **Probable, Possible** or **Speculative** (Figure 6). The largest elephant populations for Central Africa probably exist in DRC, CAR, Cameroon and Gabon.

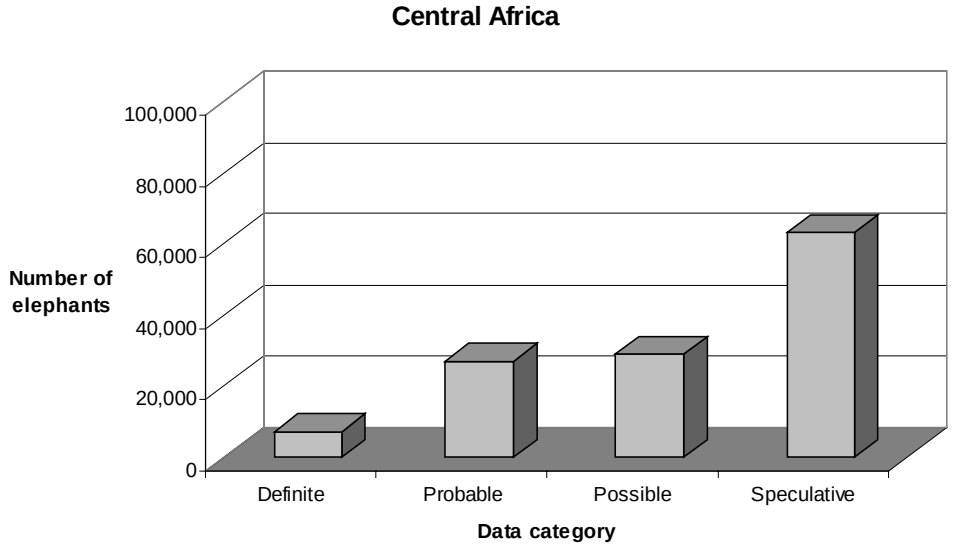


Figure 6. Elephant estimates by category for Central Africa.

Civil strife has affected two important range states in Central Africa since the last update, namely DRC and Congo, making elephant conservation activities difficult, particularly survey work. No new survey results or estimates are available for Congo, although some surveys were conducted in DRC during pauses in military activity.

There have not been any reports of large-scale poaching incidents in the sub-region over the past three years, although there are reports of fresh ivory from Central Africa being sold in West and Eastern Africa markets (Ivory Coast and Sudan).

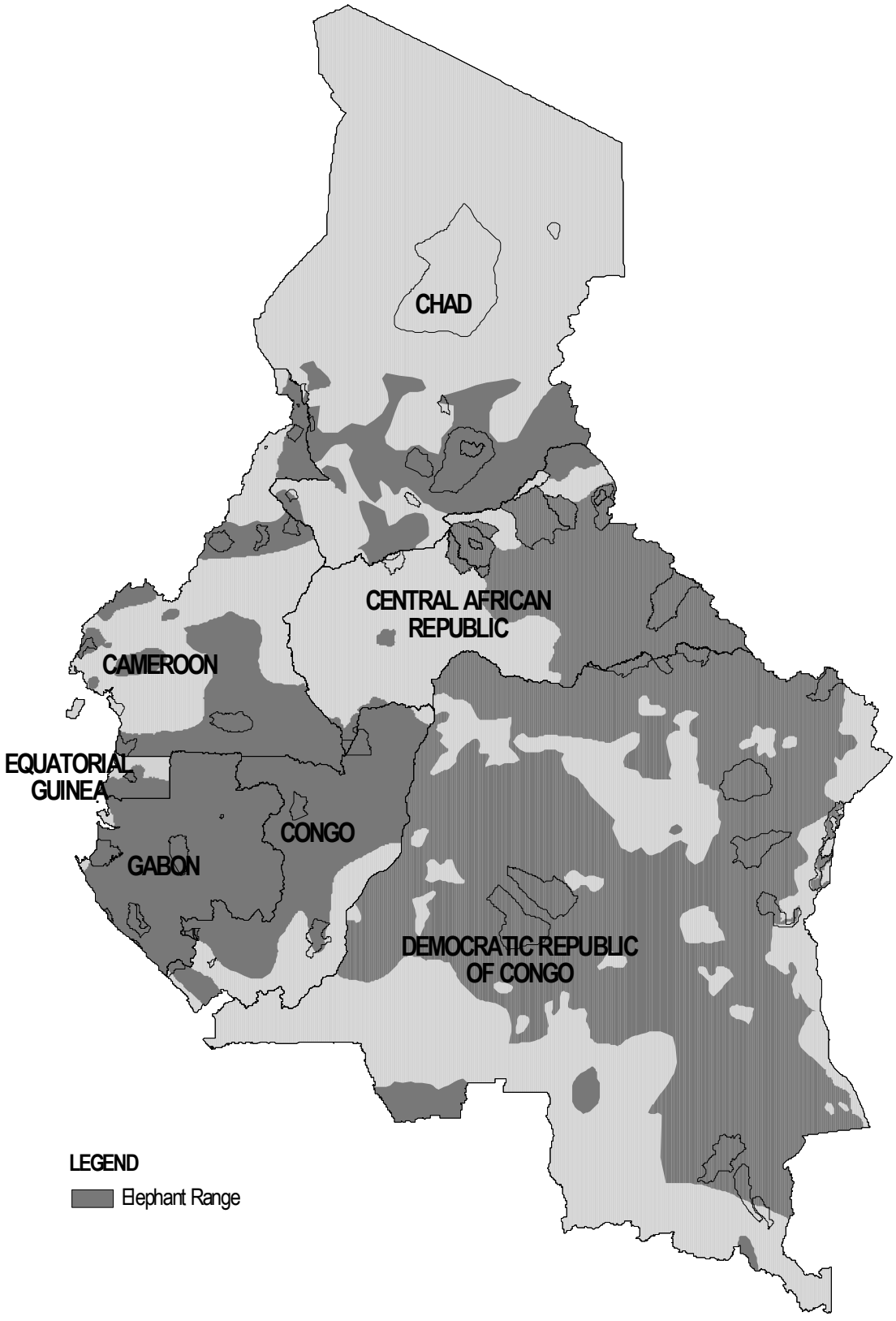
In this edition of the AED, Central Africa has a total of 31 survey zones, 15 of which have had population estimates between 1995 and 1998. Sixteen of the 31 survey zones have been surveyed by dung counts, aerial surveys or ground counts, and in the remaining survey zones the elephant populations have been estimated by either informed or other guesses.

A number of estimates in the 1995 update that were based on extrapolations from reconnaissance surveys in 1989 have been omitted from this update for the following reasons: (a) they were based on a small number of samples, (b) the assumptions on which they were based, such as the curve relating elephant density to roads (Michelmore *et al.*, 1994) may no longer be valid, (c) there may have been important changes in range (e.g. in DRC) since then and (d) the data will be ten years old by the time this update is published.

SUMMARY OF ELEPHANT ESTIMATES IN CENTRAL AFRICA

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
CENTRAL AFRICA	Cameroon	1,071	5,285	8,704	675	475,440	229,195
	Central Africa Republic	2,515	1,600	6,605	8,000	622,980	314,274
	Chad	0	0	1,600	300	1,284,000	219.130
	Congo	0	0	0	0	342,00	255,373
	Democratic Republic of Congo	3,736	20,219	5,618	120	2,345,410	1,476,560
	Equatorial Guinea	0	0	0	80	28,050	14,559
	Gabon	0	0	7,500	54,294	267,670	263,306
TOTAL		**7,322**	**27,104**	**27,613**	**63,469**	**5,365,550**	**2,772,397**

PROTECTED AREAS AND ELEPHANT RANGE IN CENTRAL AFRICA



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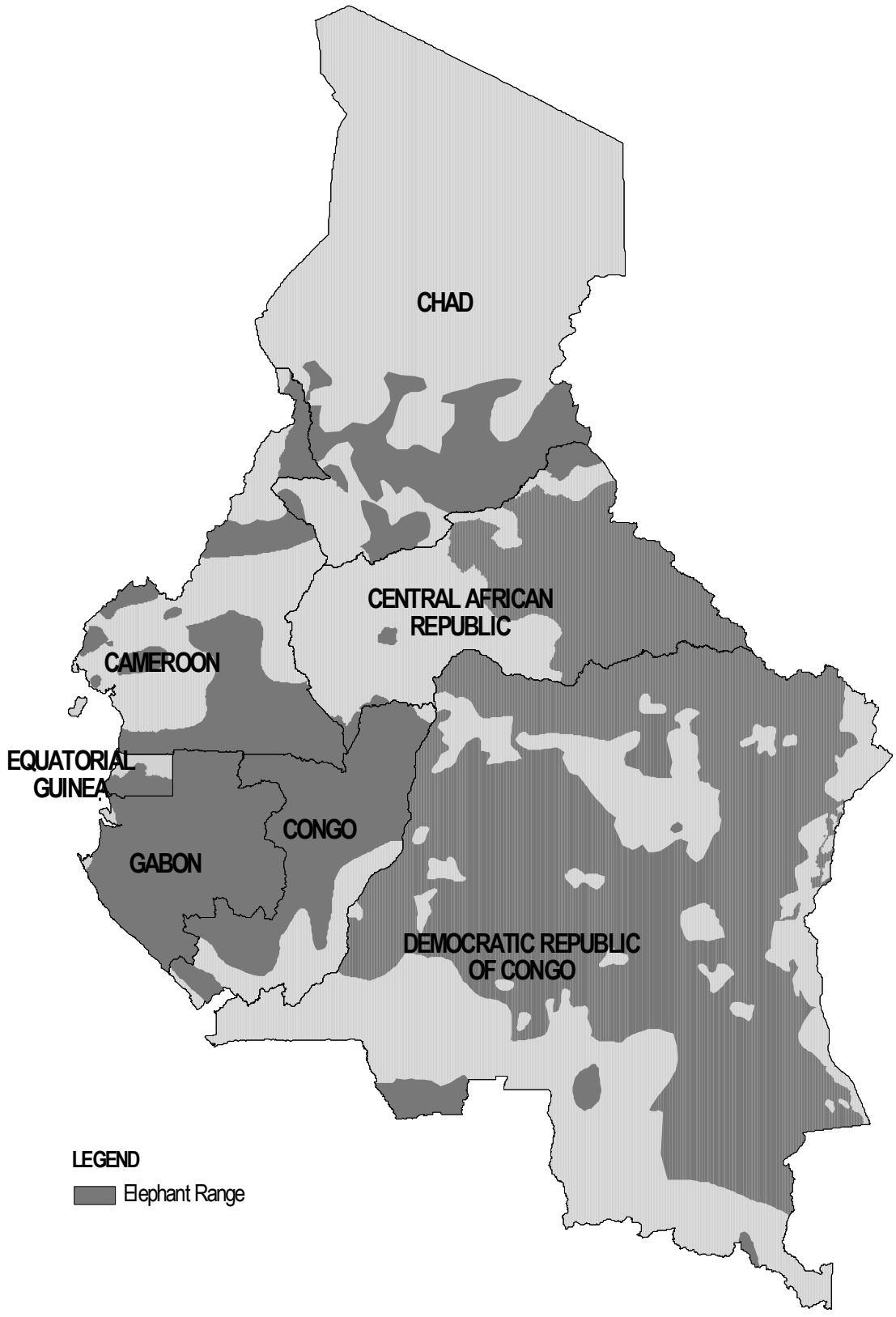
SURVEY ZONES AND ELEPHANT RANGE IN CENTRAL AFRICA



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CAMEROON

General Statistics

Country area:	475,440km^2
Range area:	228,866km^2 (48%)
Protected area coverage (% of country):	4%
Protected range (% of range in protected areas):	8%

Range

There are three distinct portions of elephant range in Cameroon, comprising the northern savanna ranges in the sahelian and sudanian regions, and the southern forest elephant range (Tchamba *et al*., 1997). The depiction of elephant range has been updated from the map and data contained in the Cameroon National Elephant Management Plan (Tchamba *et al*., 1997) and by Tchamba (pers. comm., 1998). Changes since the last update include the removal of areas of range outside Korup National Park and Banyang Mbo Forest Reserve (but not within) and the addition of a large site west of Korup National Park and northwest of the capital Douala (Tchamba *et al*., 1997). Increasing pressure for land from human populations has probably led to the loss of elephant range in the former sites.

Surveys and data

Although Cameroon is one of the better-surveyed central African countries, few new surveys have been carried out since the last AED update in 1995. There are still large parts of Cameroon - 78% of land designated as elephant range - which have not been properly surveyed.

The only new estimates in the table are based on recent dung count surveys in the Boumba Bek Forest Reserve and the Nki Reserve (Ekobo, pers. comm., 1998). Both estimates are still preliminary, however, since data are still being analysed.

Wanzie's (1993) estimate for Mount Cameroon has been inserted in the table but no information is available on how the estimate was derived. The estimate for "other forests" in the previous update has been removed, because it was based on a preliminary assessment of the status of elephants by Michelmore *et al.* (1994) and was an extrapolation based on a small sample size collected in 1989.

The northernmost population in the sahelian range is concentrated in and around Waza National Park and the existence of three sub-populations, which account for most of the elephant distribution in the north, has been well documented (Tchamba, 1993; Tchamba *et al*., 1994; Tchamba, 1995; Tchamba *et al*., 1995; Tchamba, 1998). During the wet season some elephants move to the far north, while others migrate south where they cause extensive crop damage (Tchamba, 1995; Tchamba 1998). There is also a resident population in Waza National Park. The 1991 aerial total count estimate for Waza provided by Tchamba and Elkan (1995) has not been updated although Tchamba (pers. comm., 1998) believes the population has since increased. The 1991 estimate was derived from an aerial sample survey of large mammals and ostriches during which all the elephants were counted because most were in large herds (Tchamba and Elkan, 1995). The results of a more recent line transect survey in the Waza-Logone area are still being analysed (Tchamba, pers. comm., 1998).

There have been no updates for the sudanian region since 1991 and the estimates from the previous update apply only to the three protected areas. Because of recent disturbances inside Bénoué National Park, elephant densities may be increasing outside the park in adjacent hunting areas where they have found safety (Tchamba *et al*., 1997).

There have been few accurate counts in the southern forest range, and the range is still not well documented (Tchamba *et al*., 1997). Apart from the Boumba-Bek and Nki Forest estimates (Ekobo, pers. comm., 1998), forest estimates remain unchanged since the previous AED update. In a preliminary dung count survey of the

forested Mungo Division of southwest Cameroon, elephant density was estimated at 1.3 per km^2 but no population estimate was given because the extent of elephant range is unknown (Ekobo, 1997).

Cross-border movements

Elephants disperse from their northern savanna range as far as Lake Chad in the dry season. There is evidence that in the wet season more than 100 elephants leave Boubandjida National Park and migrate into the Mayo-Kebbi region in Chad where they cause crop damage (Tchamba *et al.*, 1997). Although clear information is lacking elephants probably migrate between Cameroon and Nigeria in their northern range (Mshelbwala, 1998) and between Cameroon, Central African Republic, Gabon and Equatorial Guinea in their southern forest range.

Issues

Cameroon is one of the most ecologically diverse countries in Africa, with habitats varying from dense equatorial forest in the south to dry savanna and sahel in the north. However, expanding human populations and increasing illegal use of natural resources has put intense pressure on elephant habitats. This is particularly acute in the forest areas of southern Cameroon where there is uncontrolled logging and illegal game-meat hunting (East, 1995). Furthermore, decreased budget allocations, due to currency devaluation and economic difficulties, have reduced the ability of the management authority to carry out anti-poaching activities in most of the country's protected areas (Dublin *et al*., 1995).

The expansion of human activities has led to an increase in human-elephant conflict in many areas. In the Waza area, climatic changes, civil conflict in Chad, and construction of a nearby dam which attracts elephants in the dry season, have caused significant changes in elephant movements and brought them directly into conflict with human populations (Tchamba, pers. comm., 1998). Ekobo (1997) reported on the results of a preliminary study of elephant density and crop-raiding in the forested Mungo Division of southwest Cameroon. Crop-raiding by elephants was considered a severe problem by the local villagers and Ekobo (1997) suggests that the proximity of elephants to their farms may be partly explained by poaching pressure within the forests.

While Cameroon is one of the few range states with a national management plan for elephant conservation, there is no programme for its implementation. Cameroon is the only central African nation where trophy hunting of elephants is allowed but problems include the lack of a guiding policy, no scientific mechanism for setting quotas and no mechanism to guarantee that money generated from hunting returns to elephant conservation activities (Tchamba *et al*., 1997).

Taking all these factors into consideration, Tchamba (pers. comm., 1998) believes that elephant populations are expanding in savanna areas but probably decreasing in the southeastern forests because of continuing poaching.

Between November 1997 and March 1998, the Government of Cameroon seized over 550kg of ivory that was being exported. This is the largest amount of ivory seized in Cameroon for many years (Sebogo, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Cameroon

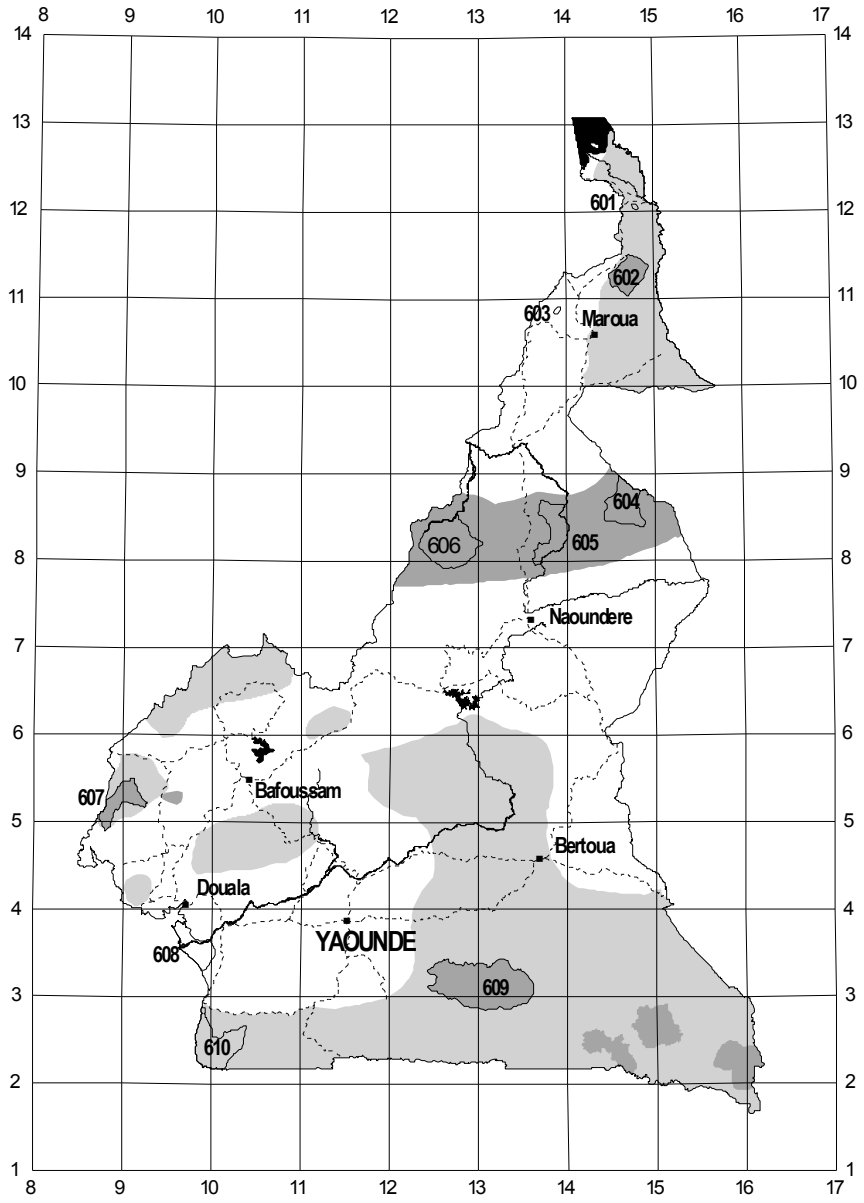
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.I.	Density (no/km^2)			
101	Waza National Park	1991	1,700	1,071		0.63	Tchamba and Elkan, 1995	AT3	A
102	Boubandjidah National Park	1991	2,200	660		0.30	Tchamba *et al*., 1991	IG3	D
103	Benoué National Park	1991	1,800	540		0.30	Tchamba *et al*., 1991	IG3	D
104	Faro National Park	1991	3,300	60		0.02	Tchamba, 1993	IG3	D
105	Korup National Park	1993	1,259	425	271	0.34	Powell, quest. reply, 1993	DC3	C
106	Dja Faunal Reserve	1995	5,260	1,500	500*	0.29	Tchamba, pers. comm., 1995	IG3	D
	Remaining Sudanian Area	1991	24,985	360		0.01	Tchamba *et al*., 1991	IG3	D
202	Banyang-Mbo Forest Reserve	1993	426	368	236	0.86	Powell, quest. reply, 1993	DC3	C
203	Mount Cameroon	1993	485	75		0.15	Wanzie, 1993	OG3	E
204	Abong-Mbang Forest Reserve	1994	1,540	100		0.06	Ekobo, 1994	OG3	E
205	Boumba-Bek Forest Reserve	1998	2,500	1,250		0.50	Ekobo, pers. comm., 1998	DC3	D
206	Nki Forest Reserve	1998	1,815	2,178		1.20	Ekobo, pers. comm., 1998	DC3	D
207	Lake Lobeke Forest Reserve	1993	1,985	3,719	2,125	1.87	Ekobo, 1995	DC2	C
208	Mongokele Forest Reserve	1991	850	773	53	0.91	Ekobo, pers. comm., 1994	DC2	C

*Range of Informed Guess

SUMMARY OF TOTALS FOR CAMEROON

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	1,071	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	5,285	2,156	0
D	Informed Guesses	0	0	6,548	500
E	Other Guesses	0	0	0	175
TOTAL		**1,071**	**5,285**	**8,704**	**675**

PROTECTED AREAS AND ELEPHANT RANGE IN CAMEROON



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 10,000,000

KEY TO PROTECTED AREAS

National Park
601 Kalamaloue
602 Waza
603 Mozogo-Gokoro
604 Boubandjidah
605 Benoué
606 Faro
607 Korup

Faunal Reserve
608 Douala-Edea
609 Dja
610 Campo

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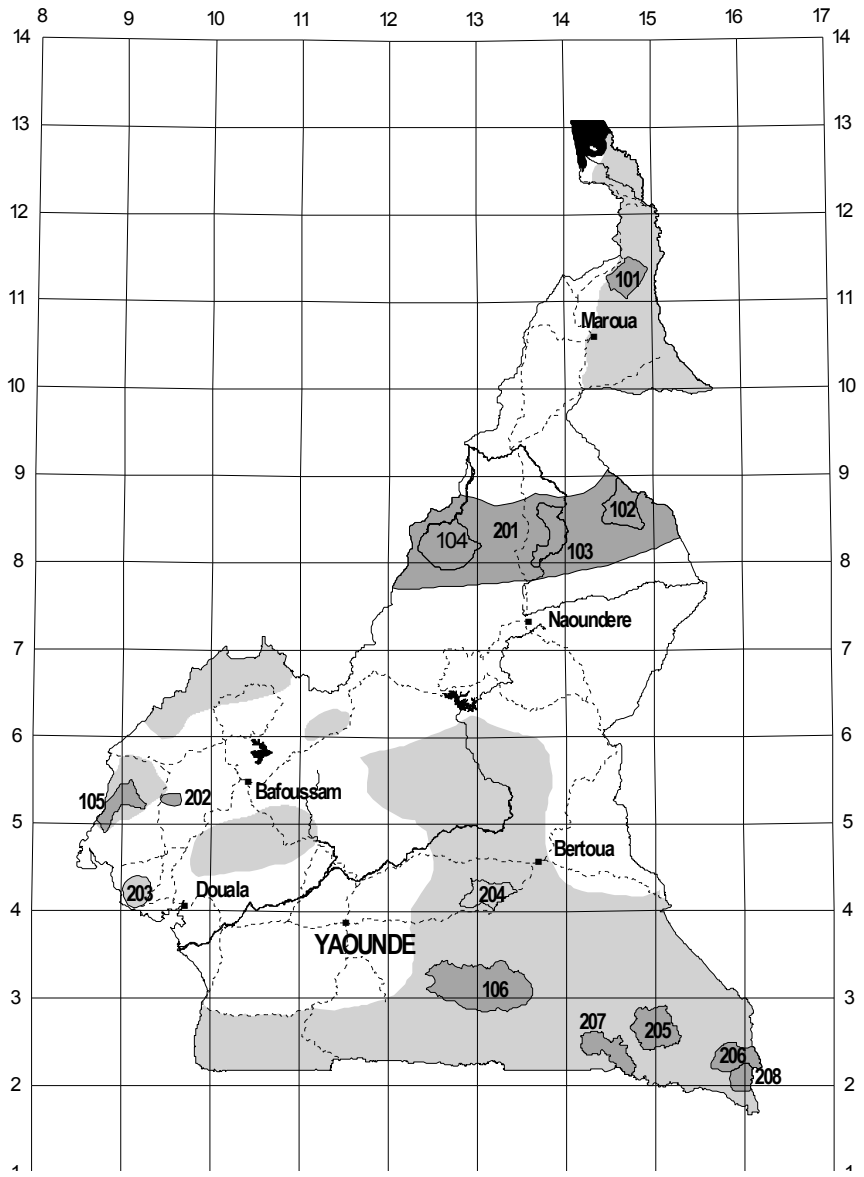
SURVEY ZONES AND ELEPHANT RANGE IN CAMEROON



LEGEND

- Town
- Road
- River
- Lake
- 301 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 10,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Waza National Park	1071
102	Boubandjidah National Park	660
103	Benoué National Park	540
104	Faro National Park	60
105	Korup National Park	425
106	Dja Faunal Reserve	1500
201	Remaining Sudanian Area	360
202	Banyang-Mbo Forest Reserve	368
203	Mount Cameroon	75
204	Abong-Mbang Forest Reserve	100
205	Boumba-Bek Forest Reserve	1250
206	Nki Forest Reserve	2178
207	Lake Lobeke Forest Reserve	3719
208	Mongokele Forest Reserve	773

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CENTRAL AFRICAN REPUBLIC

General Statistics

Country area:	620,000 km^2
Range area (% of country):	314,274km^2 (50%)
Protected area coverage (% of country):	12%
Protected range (% of range in protected areas):	21%

Range

No changes have been made to elephant range since the last update. Elephants are distributed in two separate areas: that of the north and east, which is largely savanna, and the southwestern forested range.

Surveys and data

Few new surveys have taken place in the Central African Republic (CAR). Turkalo (questionnaire reply, 1998) has carried out the most recent survey work through her direct counting of elephants in clearings in Dzangha-Sangha and Dzangha-Ndoki. She has so far identified 2,515 individuals (which are therefore placed in the **Definite** category) and estimates that there are between 3,000 and 6,000 elephants in the total population. Other work includes that of Kpanou *et al.*(1998), who conducted a dung count in the Bangassou Forest.

An informed guess by Tello (pers. comm., 1998) for the northern portion of CAR is based on observations by field personnel, and has replaced previous aerial survey estimates by Douglas-Hamilton *et al.*(1985) for the Bamingui-Bangoran Complex, Manovo Grounds – St Floris Complex, Manovo Intensive, Rhino Sector and Vassako-Bolo, which are more than ten years old.

Cross-border movements

There are likely to be cross-border movements of elephants between CAR and Cameroon, Congo, DRC and possibly Chad (Dejace, 1996).

Issues

It is often said that CAR is one of the most important strongholds for wildlife on the continent, but it is also one of the least studied (East, 1995). In the past, low human population densities left large areas of elephant habitat undisturbed, which is particularly true in the savanna areas of the northeast. However, as in many African countries, there are increasing threats to elephant populations.

Recent civil unrest in CAR has led to increased accessibility to firearms. The availability of guns, coupled with civil unrest in neighbouring countries and poor border control, gives poachers easy access to wildlife (Turkalo, questionnaire reply, 1998). Poaching levels are increasing in the savanna range (Blom, pers. comm., 1998) and illegal hunting by Sudanese, Chadians and locals presents a real threat to elephant populations.

The Programme de Développement de la Région Nord (PDRN) in northeastern CAR authorised temporary protection to the region, but after the closure of the project a large sector of protected land will be abandoned. Meanwhile, a new project aims to improve the protective status of the Bangassou Reserve (Turkalo, questionnaire reply, 1998; Blom, pers. comm., 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Central African Republic

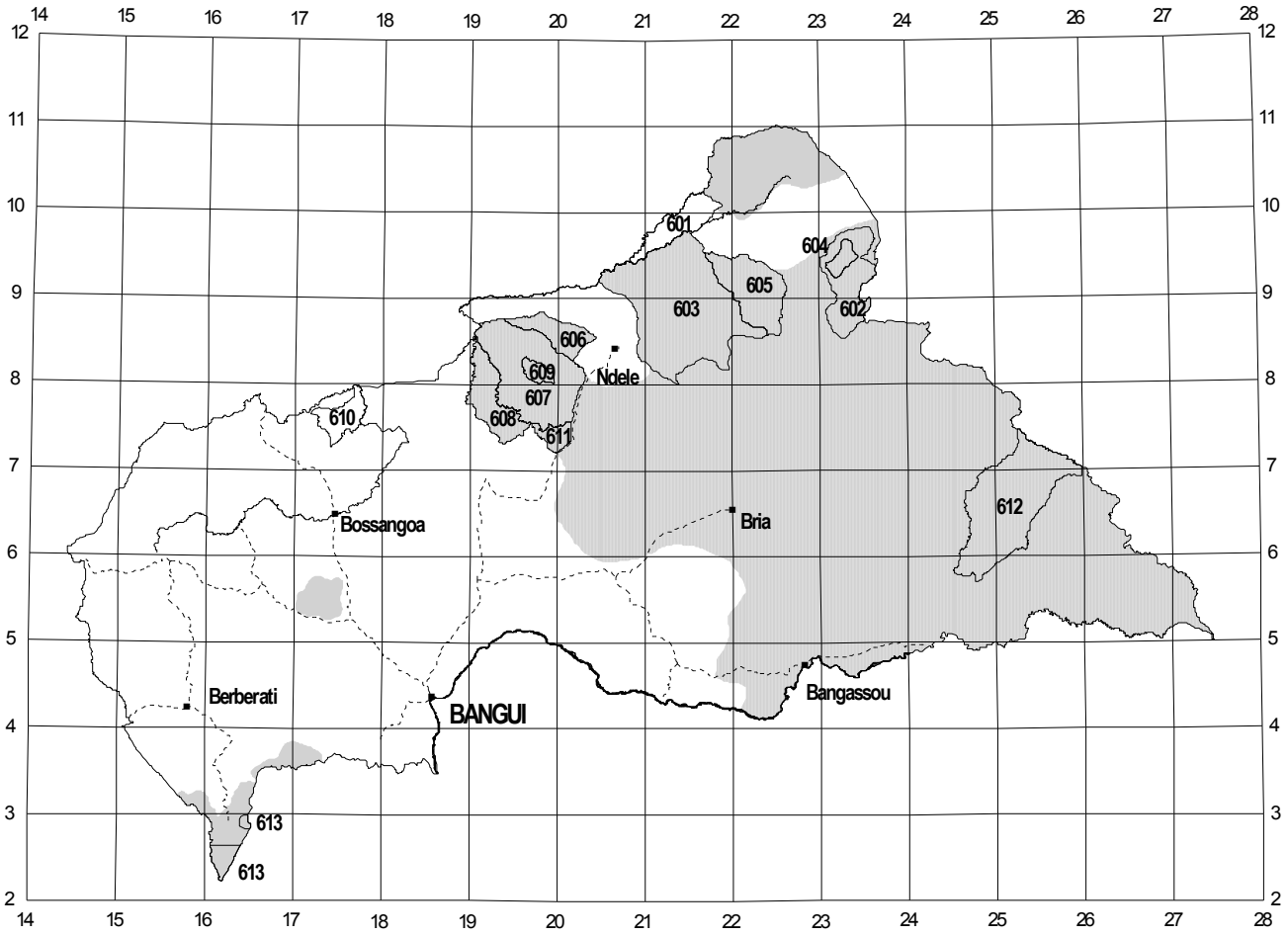
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Northern Savanna	1998	38,240	5,000	5,000*	0.13	Tello, pers. comm., 1998	IG3	D
201	Bangassou Forest Reserve	1996	16,600	1,600	1120	0.10	Kpanou *et al*., 1998	DC3	C
301	Dzanga-Sangha Special Reserve & Dzanga-Ndoki National Park	1998	4,743	3,000	3,000*	0.63	Turkalo, quest. reply, 1998	IG3	D

* Range of Informed Guess

SUMMARY OF TOTALS FOR CENTRAL AFRICAN REPUBLIC

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	1,600	1,120	0
D	Informed Guesses	2,515	0	5,485	8,000
E	Other Guesses	0	0	0	0
TOTAL		**2,515**	**1,600**	**6,605**	**8,000**

PROTECTED AREAS AND ELEPHANT RANGE IN CENTRAL AFRICAN REPUBLIC



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 10,000,000

KEY TO PROTECTED AREAS

National Park
603 Manova-Gounda-Saint Floris
604 André Felix
607 Bamingui-Bangoran
613 Dzanga-Ndoki

Private Reserve
606 Park Presidentiél Avakaba

Strict Nature Reserve
609 Vassako-Bolo

Faunal Reserve
601 Aouk-Aoukale
602 Yata-Ngaya
605 Oandjia-Vakaga
608 Gribingui-Bamingui
610 Nana-Barya
611 Koukourou-Bamingui
612 Zemongo

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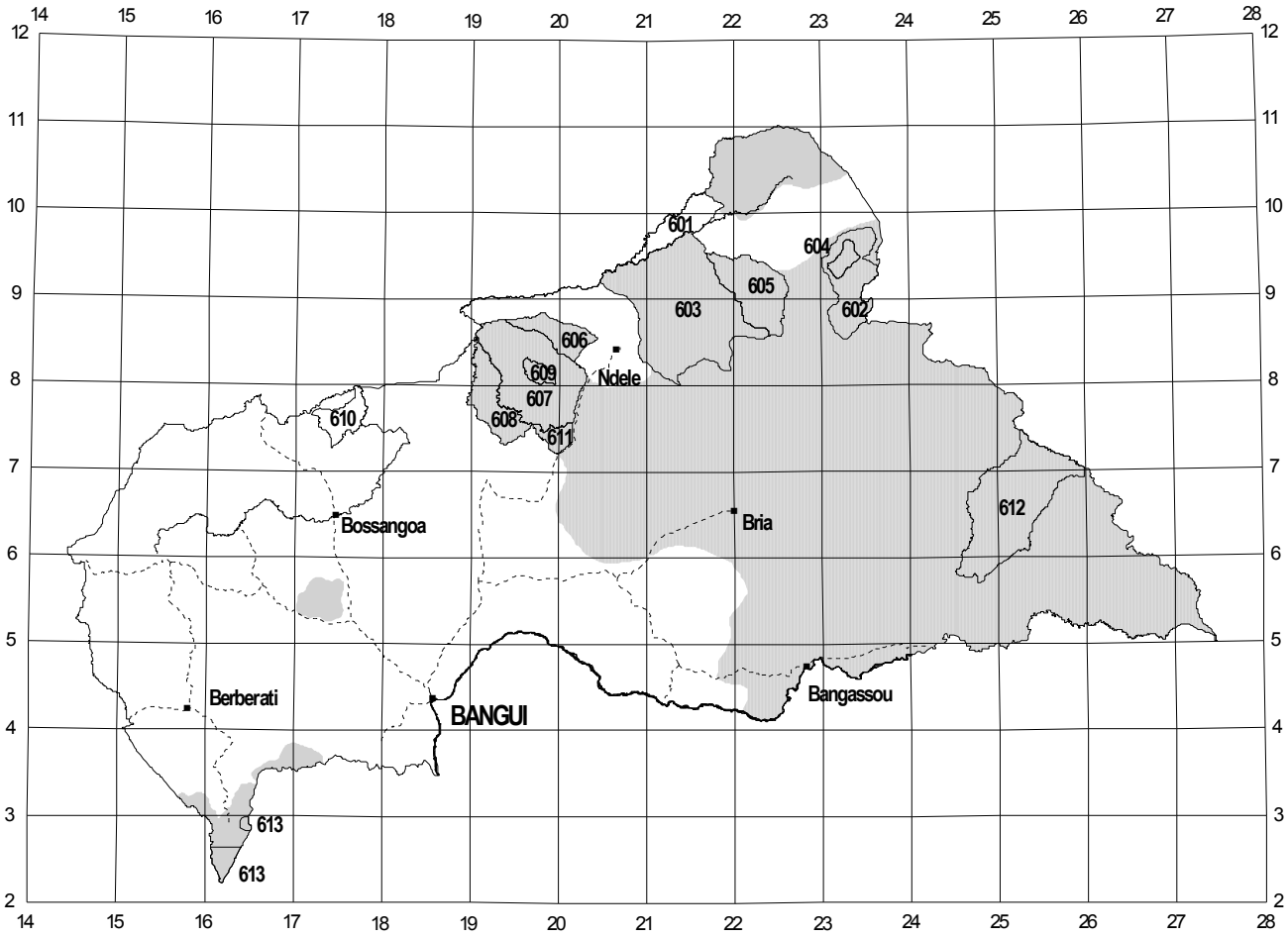
SURVEY ZONES AND ELEPHANT RANGE IN CENTRAL AFRICAN REPUBLIC



LEGEND

- Town
- Road
- River
- Lake
- 301 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 10,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Northern Savanna	5000
201	Bangassou Forest Reserve	1600
301	Dzanga-Sangha and Dzanga-Ndoki	3000

N

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CHAD

General Statistics

Country area:	1,284,000 km^2
Range area (% of country):	219,130km^2 (17%)
Protected area coverage (% of country):	9%
Protected range (% of range in protected areas):	14%
Range with surveys or population estimates (% of country):	10%

Range

Elephant range is restricted to southern Chad. The range estimate was recently updated by Dejace (1996) who indicates that elephant range has expanded. This expansion was confirmed by N'Dikibaye (questionnaire reply, 1998). It may be due to better information, as more studies are being conducted around Zakouma. The most significant range lies within Zakouma National Park, which is an important dry season refuge for elephants and is well protected (Dejace, 1996).

Surveys and data

One survey has taken place since the last AED update: an aerial sample count carried out by Dejace (1996) in 1995 and 1996 (both dry and wet season) which encompassed Zakouma National Park, Bahr Salamat and Siniaka-Minia. This survey replaces the estimate in the 1995 update provided by the DPNRF (1991). The majority of elephants in the surveyed area are found within Zakouma National Park, but distribution is dependent on season (Dejace, 1996).

Cross-border movements

Between 300 and 400 elephants migrate between Chad (around Lake Chad) and Cameroon, but nevertheless spend the majority of their time in Cameroon (Tchamba *et al.*, 1997; Bita, 1997). It is thought that these elephants come into conflict with human communities on their migration between the two countries. Dejace (1996) also believes that elephants move between Chad and CAR, although this has not been verified.

Issues

Wildlife populations were adversely affected during the 20-year civil war in Chad. However, the cessation of hostilities in the 1990s has led to a period of rebuilding and rehabilitation of the national parks that should lead to enhanced management and security efforts for elephants (East, 1996). Accompanying this progress is some improvement in the economy, although Chad remains one of the poorest countries in Africa.

Zakouma National Park and its surrounds have become much safer areas for elephants over the past eight years, thanks in part to assistance provided by the European Union for southeast Chad, which included funds for rebuilding park infrastructures and initiating community awareness programmes.

Conflict between elephants and people in Chad is negligible due to two factors. First, the elephant population is still small, and therefore resides mostly in secure areas, such as Zakouma. Second, Zakouma provides protection to elephants as well as dry season access to water and food, so the animals do not need to venture outside, where there is considerable dry season pressure in November from cattle (Dejace, 1996).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Chad

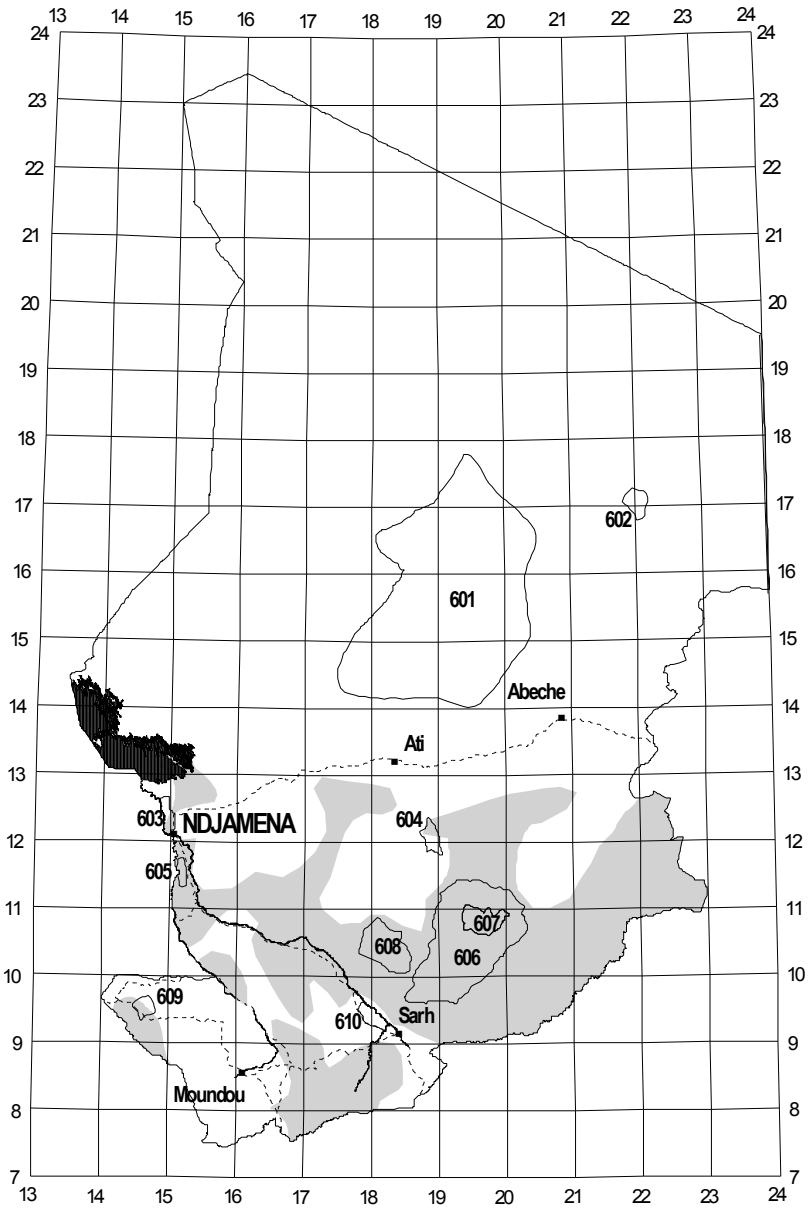
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
301	South Chad	1996	25,070	1,600	300*	0.06	Dejace, 1996	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR CHAD

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	1,600	300
E	Other Guesses	0	0	0	0
	TOTAL	**0**	**0**	**1,600**	**300**

PROTECTED AREAS AND ELEPHANT RANGE IN CHAD



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 13,000,000

KEY TO PROTECTED AREAS

National Park
607 Zakouma
610 Manda

Faunal Reserve
601 Ouadi Rimé-Ouadi Achim
602 Fada Archei
603 Bas Chari
604 Abou Telfane
605 Mandelia
606 Bahr Salamat
608 Siniaka-Minia
609 Binder-Léré

N

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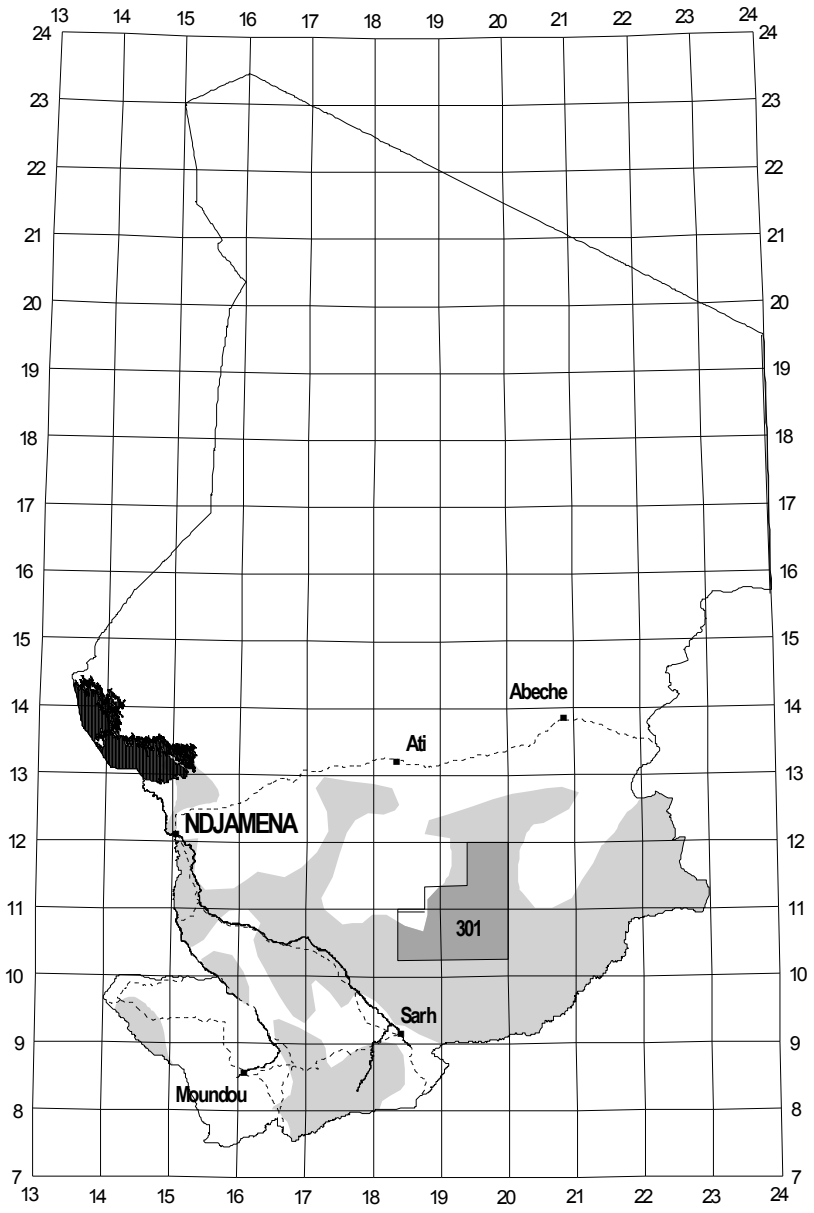
SURVEY ZONES AND ELEPHANT RANGE IN CHAD



LEGEND

- Town
- Road
- River
- Lake
- 301 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 13,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
301	South Chad	1600

N

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CONGO

General Statistics

Country area:	342,000 km^2
Range area (% of country):	255,373km^2 (75%)
Protected area coverage (% of country):	4%
Protected range (% of range in protected areas):	5%

Range

Nearly two-thirds of the Congo is forested, making it difficult to conduct surveys. Because of political instability in 1996 and 1997, no information regarding changes in elephant range has become available since the last AED update.

Surveys and data

No new surveys have taken place. The estimates from N'Sosso (1994 ,1995), which were extrapolated estimates from dung surveys in three forest sites ten years ago, have been removed from the database. The ongoing civil unrest in Congo, combined with reports of heavy poaching , render the pre-1990 data unreliable.

Cross-border movements

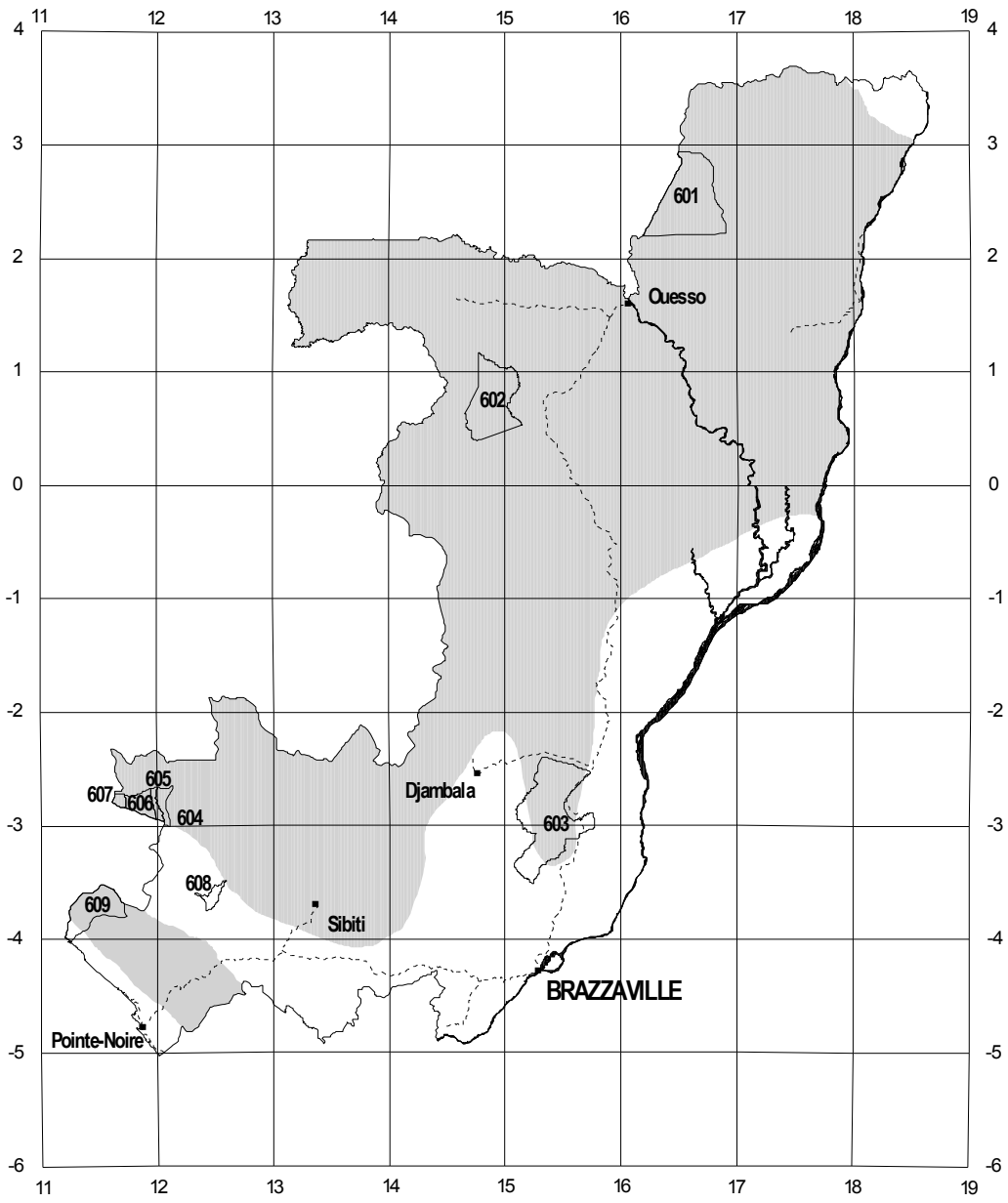
It is likely that elephants are crossing from Congo into CAR, Cameroon, DRC and Gabon. High densities of elephants have been recorded in the forests that straddle the borders of southeast Cameroon, southwest CAR, and northern Congo (Turkalo and Fay, 1995; Turkalo, 1996; Vanleeuwe *et al.*, 1997) and it is likely that elephants from the well-studied Dzangha-Sangha and Dzagha-Ndoki populations of CAR, move into Congo. Noteably, some of these estimates have been placed in the **Definite** category in their respective countries.

Issues

In early June 1997 civil war erupted in the capital of Congo, Brazzaville. Heavy fighting between rival political factions ensued and most of the city was destroyed. The war ended in late 1997 but it seriously diminished the country's capacity to manage protected areas.

As in other central African nations, unchecked logging is one of the most serious threats to elephant populations because it exposes previously inaccessible areas to meat and ivory poachers, as well as destroying important habitat.

PROTECTED AREAS AND ELEPHANT RANGE IN CONGO



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 Nouabale
602 Odzala

Hunting Reserve
606 Mont Mavoumbou

Faunal Reserve
603 Lefini
604 Nyanga Sud
605 Nyanga Nord
607 Mont Fouari
608 Tsoulou
609 Conkouati

N

Scale 1 : 7,500,000

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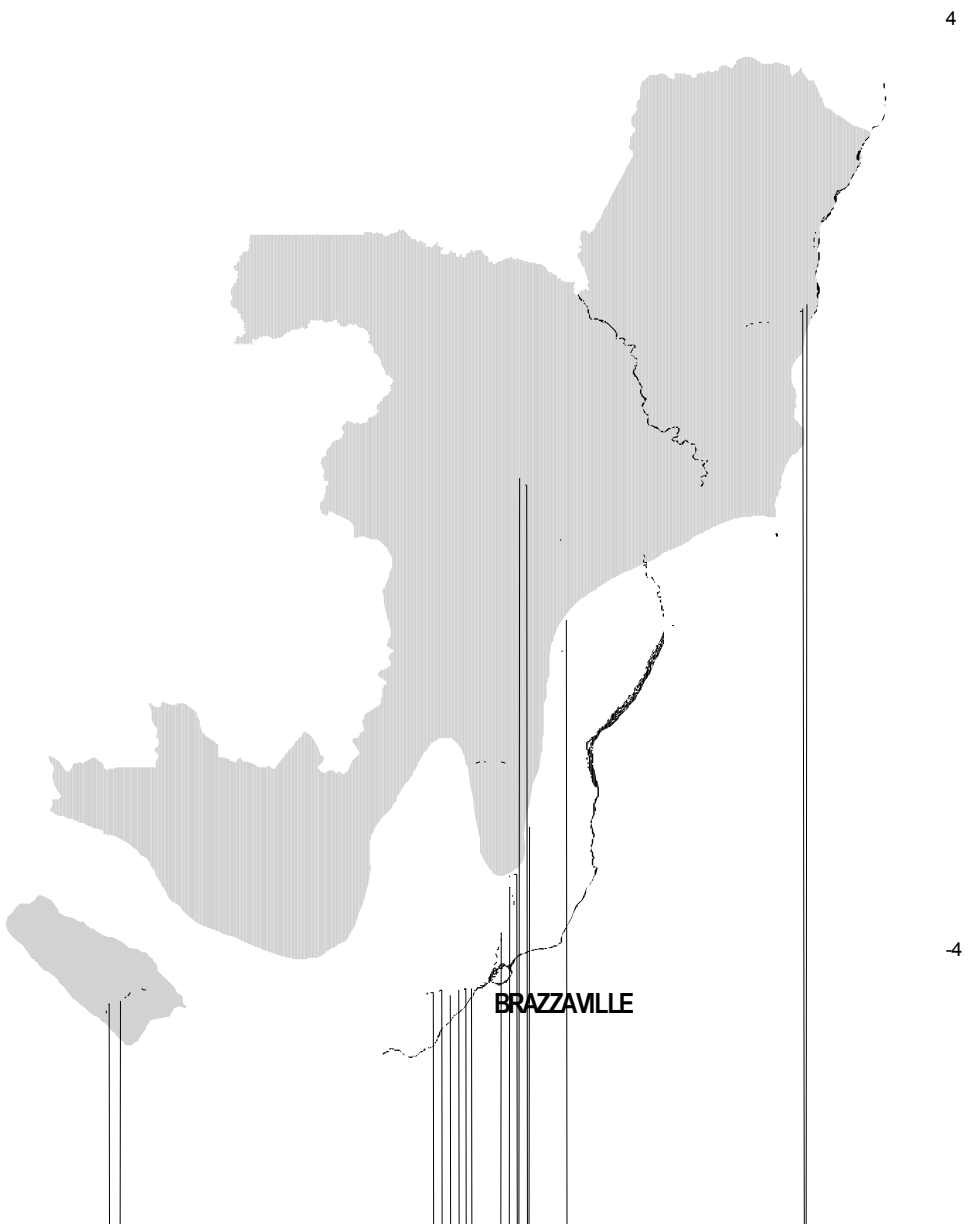
SURVEY ZONES AND ELEPHANT RANGE IN CONGO



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 7,500,000

KEY TO POPULATION ESTIMATES

No recent censuses have been carried out in Congo

N

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DEMOCRATIC REPUBLIC OF CONGO

General Statistics

Country area:	2,345,410 km^2
Range area (% of country):	1,476,560km^2 (75%)
Protected area coverage (% of country):	9%
Protected range (% of range in protected areas):	14%

Range

No change has been made to the range map since 1995; however, it is almost certainly inaccurate. When civil war began in 1997 most field projects were closed down and since then there has been very little new information on range. Even before the war, information was scarce and there were doubts concerning its accuracy. In fact, the range for the forest zone is largely assumed.

Surveys and data

Despite the recent unrest, some surveys have been conducted in DRC since 1995. They include those of Garamba National Park (Hillman Smith, 1998; questionnaire reply, 1998), Okapi National Park (Hart, pers. comm., 1998), and Kahuzi-Biega (Hall *et al*., 1997). Each of these sites has an ongoing long-term monitoring programme. However, there are still large portions of DRC which remain unsurveyed, leaving the status of elephant populations uncertain in what may be the largest expanse of elephant range remaining on the continent.

Hart (pers. comm., 1998) provides the first estimate on forest elephant numbers for the Okapi National Park. This survey estimate has replaced that of the previous estimate for Ituri, as Ituri is included in the Okapi survey zone. In addition, the estimate for Maiko National Park was revisited and changed from 6,000 to 6,500 elephants based on new information from Hart (pers. comm., 1998). The estimates provided by Alers *et al*. (1992) for Salonga, Lomami and the rest of the forest zone, which appeared in the 1995 update, were based on a small amount of data collected in 1989 and have therefore been removed.

In Virunga National Park, despite ongoing civil unrest, Mubalama (1998) conducted a preliminary census of elephants using dung count methdology and direct observation. Although elephant density was analysed from the dung survey, Mubalama (1998) reported seeing 486 elephants in the central section of VNP over a three-month period, sometimes in groups of over 100 individuals and therefore this estimate has been placed in the **Definite** category. As this estimate excludes the northern and southern sections of the park, however, this estimate cannot be taken as an accurate figure for the entire Virunga National Park. Many of the elephants may have used Queen Elizabeth National Park in Uganda as a refuge during the war (Hart, pers. comm., 1998). Of critical note is the extirpation of the elephants around Mount Tshiaberimu in Virunga National Park (Sarmiento and Butynski, 1997).

Cross-border movements

Elephants move from DRC into the Queen Elizabeth National Park in Uganda (Hart, pers. comm., 1998; Michelmore, pers. comm., 1998) and into the Toro/Semliki range in Uganda (Michelmore, pers. comm., 1998). Elephants may also move from DRC into Zambia. It is possible that elephants from Virunga National Park in Rwanda may cross into DRC (Bizimana, pers. comm., 1998).

Issues

DRC's forests cover approximately one million km^2 and may harbour some of the continent's largest elephant populations. Most protected areas in DRC are forested, with the exception of Garamba which is savanna, and therefore most of DRC's elephant populations are forest elephants.

Due to the change in government, and the hesitancy of donors to recommence aid, DRC is in desperate need of assistance. The infrastructure has broken down and few resources are available, making elephant conservation even more difficult than before. Survey work is urgently needed in large portions of the country. However, the

political situation in recent years has limited survey work and some estimates are several years old. Elephant populations in Okapi seem to have remained stable or have even grown (Hart, pers. comm., 1998). Unfortunately, elephant populations in the upland sector of Kahuzi-Biega have decreased substantially because of the war (with an estimated 150 elephants poached), and no information is available for the lowland sector (Hart, pers. comm., 1998). Hall *et al.*(1997) also found signs of poaching and human encroachment of Kahuzi Biega. Furthermore, Hillman Smith (1998a) conducted surveys in Garamba in 1995 and 1998 which indicated a significant reduction in elephant numbers in Garamba National Park during the war, although there was no physical evidence of poaching seen from the air. It does appear that overall, the civil unrest caused serious local elephant losses e.g.in Kahuzi-Biega, but did not lead to large-scale elephant poaching in most of the country (Hart, pers. comm., 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Democratic Republic of Congo

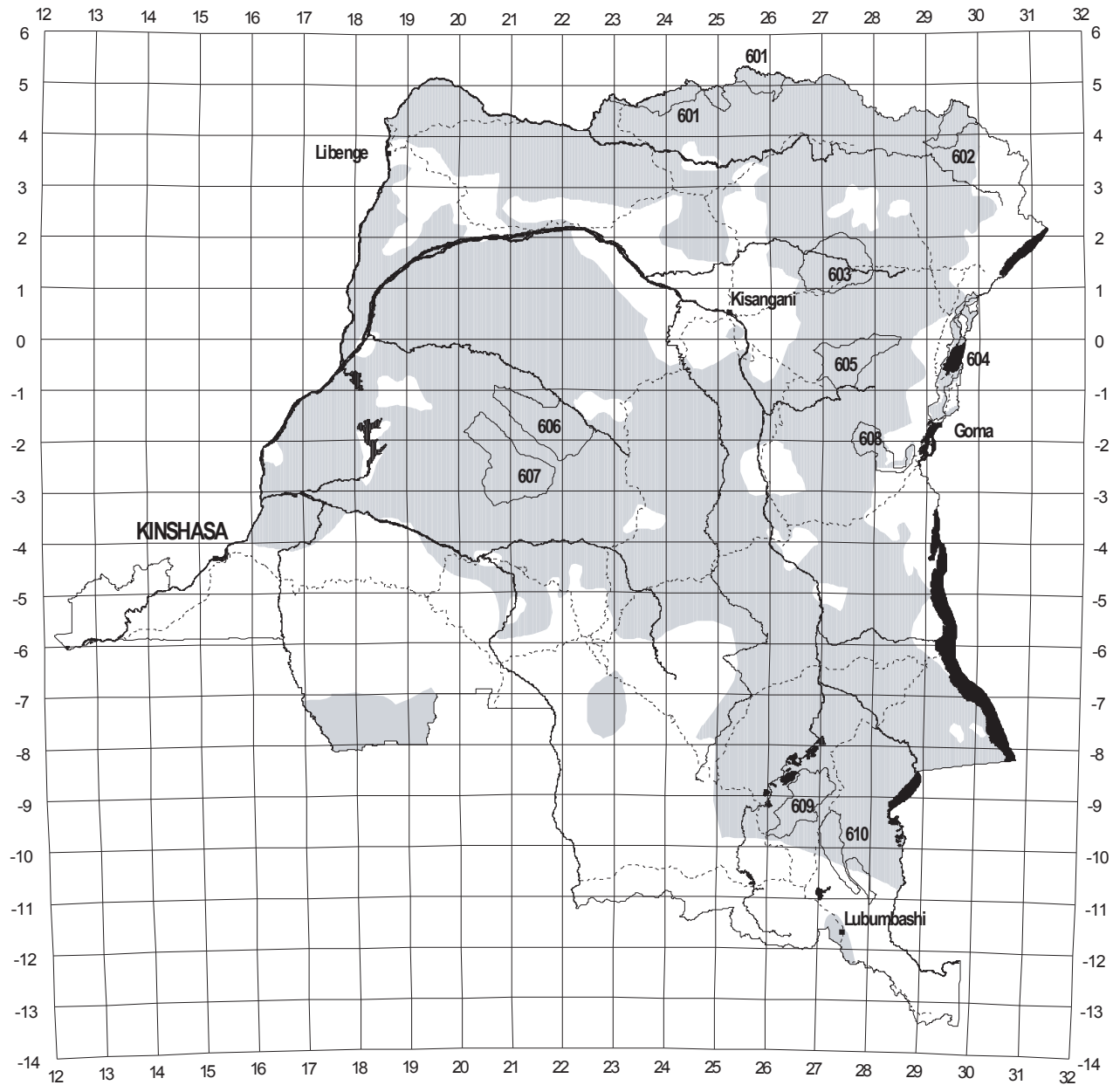
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Garamba National Park	1998	5,000	5,874	2,624	1.17	Hillman Smith, quest. reply,1998	AS2	B
102	Okapi National Park	1995	13,700	7,375	2,675	0.54	Hart, pers. comm., 1998	DC2	C
103	Virunga National Park	1998	7,800	486*		0.06	Mubalama, 1998	GT1	A
104	Maiko National Park	1992	10,830	6,500	500	0.60	Hart and Sikubwabo, 1994	DC1	C
201	Bushimae	1987	5,255	120		0.02	Won wa Musiti, Quest. Reply, 1991	IG3	E
301	Kahuzi-Biega	1995	15,570	3,720	1,350	0.24	Hall *et al*., 1997	DC2	C

*Estimate excludes northern and southern sections of the park.

SUMMARY OF TOTALS FOR DEMOCRATIC REPUBLIC OF CONGO

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	486	0	0	0
B	Aerial or Ground Sample Counts	3,250	2,624	2,624	0
C	Dung Counts	0	17,595	2,994	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	120
TOTAL		**3,736**	**20,219**	**5,618**	**120**

PROTECTED AREAS AND ELEPHANT RANGE IN DEMOCRATIC REPUBLIC OF CONGO



LEGEND

- Town
- Road
- River
- Lake
- 602 Protected Area
- Elephant Range

Scale 1 : 15,000,000

KEY TO PROTECTED AREAS

National Park
602 Garamba
603 Okapi
604 Virunga
605 Maiko
606 Salonga Nord
607 Salonga Sud
608 Kahuzi-Biega
609 Upemba
610 Kundelungu

Strict Nature Reserve
601 Bomu

N

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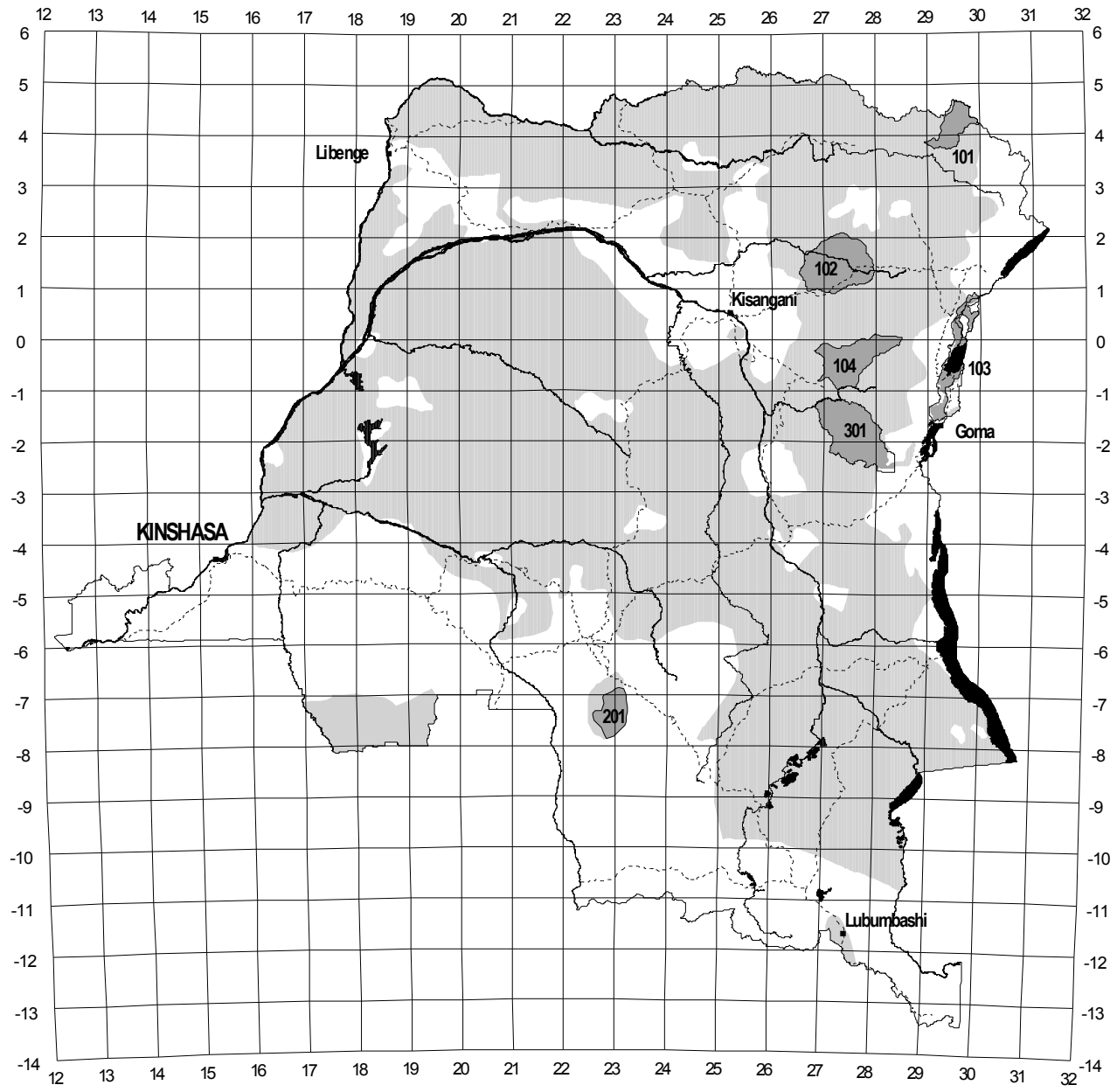
SURVEY ZONES AND ELEPHANT RANGE IN DEMOCRATIC REPUBLIC OF CONGO



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 15,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Garamba National Park	5874
102	Okapi National Park	7375
103	Virunga National Park	486
104	Maiko National Park	6500
201	Bushimae	120
301	Kahuzi-Biega	3720

N

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EQUATORIAL GUINEA

General Statistics

Country area:	28,000 km^2
Range area (% of country):	14,559km^2 (52%)
Protected area coverage (% of country):	3%
Protected range (% of range in protected areas):	5%

Range

The depiction of elephant range has not been updated since the previous AED update. It is clear that information is lacking because the country's elephant range is not contiguous with that of its neighbouring countries, Cameroon and parts of Gabon.

Surveys and data

There have been no new surveys since 1995, and only one new estimate has become available. Arranz (pers. comm., 1995) estimated that there were approximately 80 to 90 elephants in Monte Alen Partiel Reserve. He states that 40 groups of elephants have been seen, ranging in size from one to eight elephants.

In the AED 1995 update the estimate for the number of elephants in the Equatorial Guinea forests came from Michelmore *et al*. (1994). However, the figure was an extrapolation based on preliminary fieldwork done elsewhere in 1989, and so it has been removed.

Cross-border movements

Elephants may move from Equatorial Guinea into Gabon (Arranz, pers. comm., 1995) and possibly from Cameroon's southern forest range into Equatorial Guinea.

Issues

Information from Won wa Musiti (pers. comm., 1998) indicates that the elephant populations in Equatorial Guinea are increasing and that there is relatively little poaching. However, Arranz (pers. comm., 1995) says that there are no elephants north of the Uoro River due to excessive hunting. In general, there is little available information and survey work is clearly needed to determine the status of elephants in Equatorial Guinea.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Equatorial Guinea

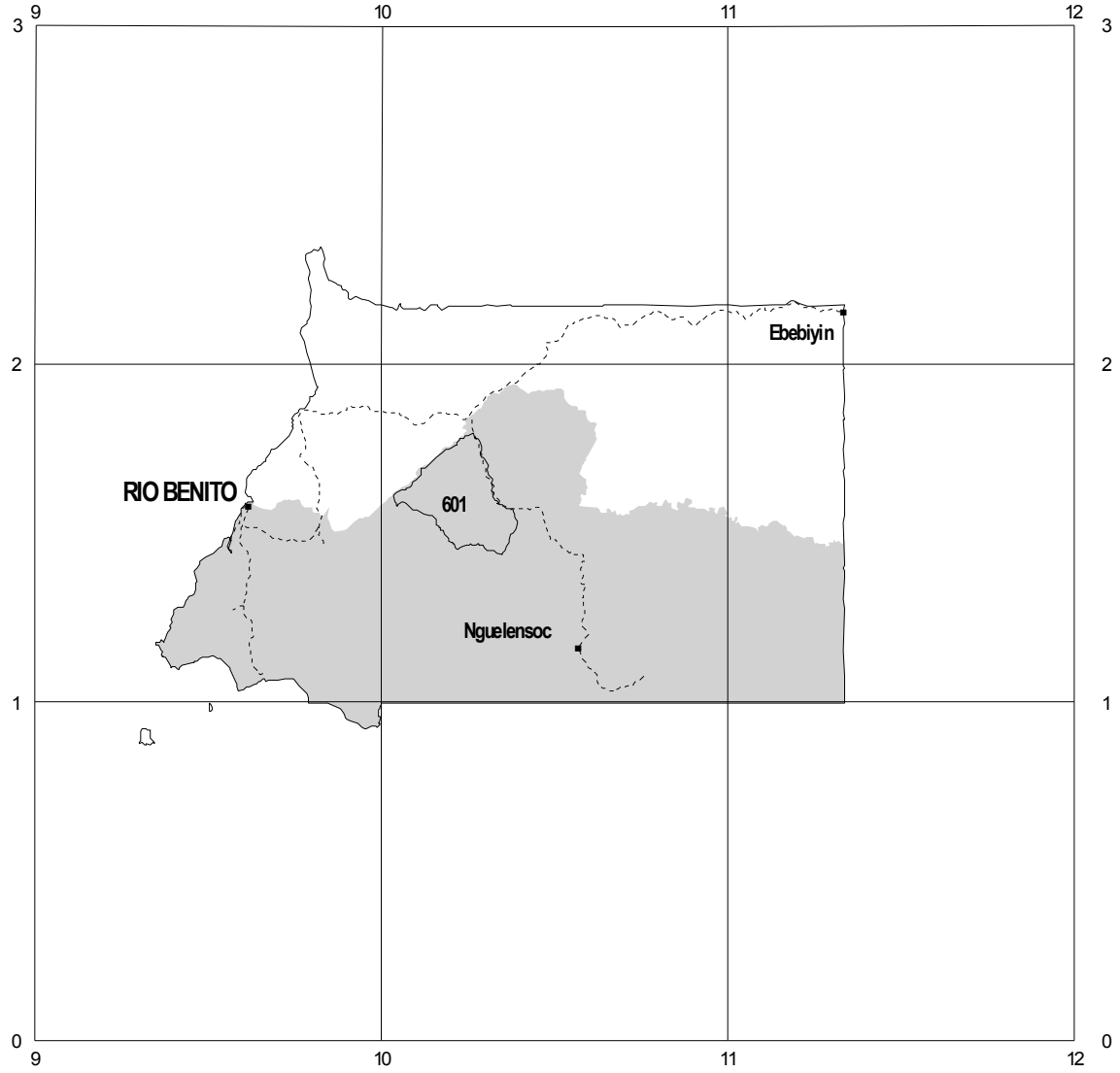
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Monte Alen National Park	1995	800	80	10*	0.10	Arranz, pers. comm., 1995	OG3	E

*Range of Informed Guess

SUMMARY OF TOTALS FOR EQUATORIAL GUINEA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	80
TOTAL		**0**	**0**	**0**	**80**

PROTECTED AREAS AND ELEPHANT RANGE IN EQUATORIAL GUINEA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

Protected Area
601 Monte Alen

N

Scale 1 : 2,500,000

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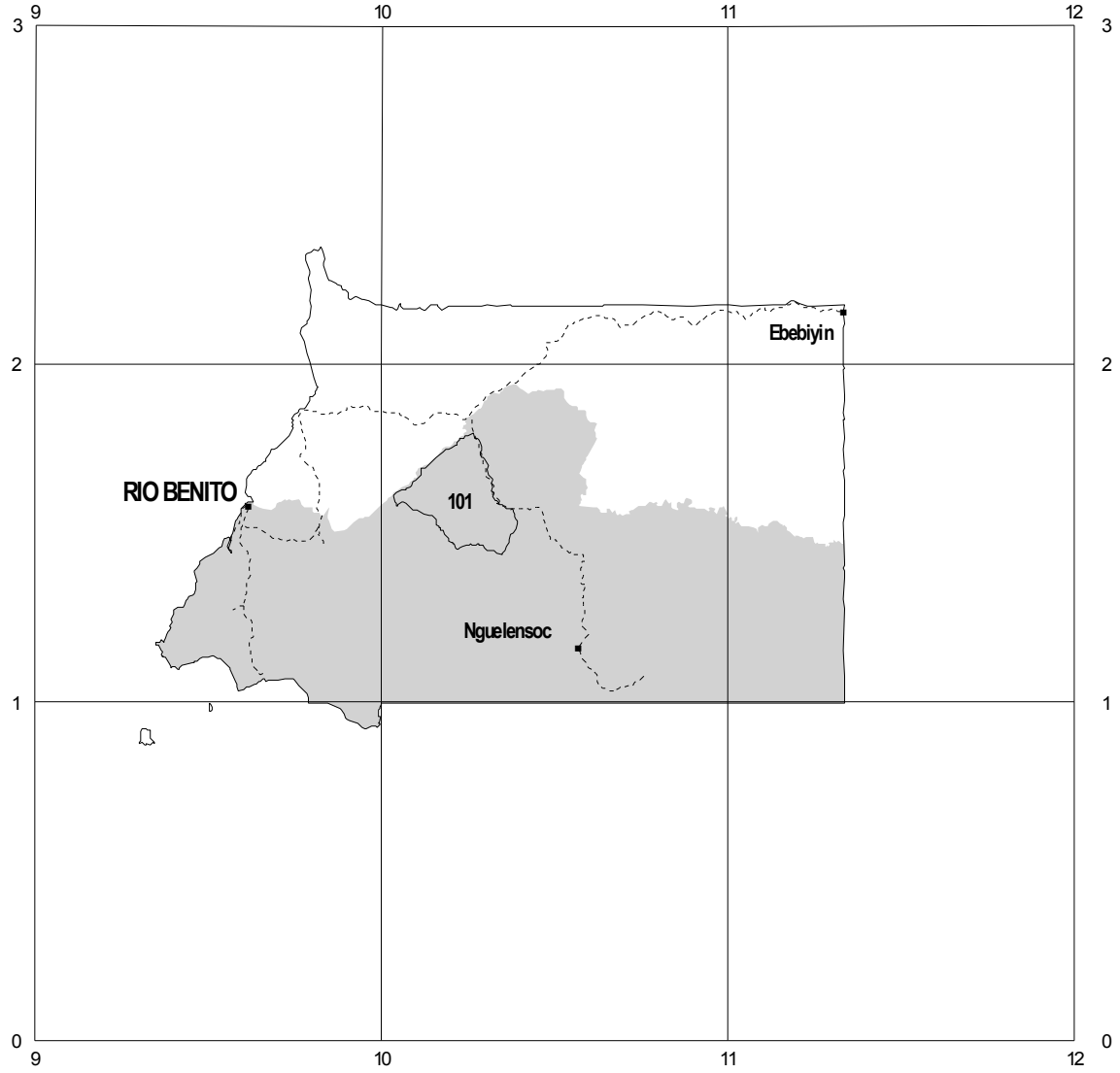
SURVEY ZONES AND ELEPHANT RANGE IN EQUATORIAL GUINEA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 2,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Monte Alen National Park	80

N

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GABON

General Statistics

Country area:	267,000 km^2
Range area (% of country):	263,306km^2 (98%)
Protected area coverage (% of country):	6%
Protected range (% of range inprotected areas):	6%

Range

Over three-quarters of Gabon is forested, representing an important range for forest elephants, with large, undisturbed tracts of land, especially in the northeast. Elephant range has been updated according to the map provided by Barnes *et al.* (1997).

Surveys and data

The number of elephants in the forests of Gabon was estimated from a stratified dung survey conducted between 1985 and 1988 (Barnes *et al*., 1995a). Since the data are more now ten years old, the survey reliability is now classified as E. The remaining estimates are for the Lopé Reserve and the Gamba complex, provided by White (pers. comm., 1998) and Walsh (pers. comm., 1998) respectively. White (pers. comm., 1998) revised his previous estimate of 5,500 for Lopé downwards to 4,500, basing his revision on his use of a better vegetation map for extrapolating his data. The data still originate from his earlier studies, between 1984 and 1991, in the forests of Lopé (White, 1994). Walsh (pers. comm., 1998) conducted dung count surveys in the Gamba complex and gives an estimate of 3,000 to 4,000 elephants, which is classified as an informed guess because his final analysis is incomplete and depends on how the study area is stratified.

Cross-border movements

It is likely that there are cross-border movements of elephants in and out of Gabon from Cameroon, Congo and Equatorial Guinea, but information is lacking.

Issues

It is noteworthy that there are no national parks in Gabon and all the reserves are being logged or mined (White, questionnaire reply, 1998), but some changes to protected areas have taken place over the past three years. The approximately 7,000km^2 Minkebe Reserve in northeast Gabon was classified as a protected area in September 1997. However, it has only provisional/temporary protected status and has not been legally gazetted (Lahm, questionnaire reply, 1998). Lopé has been divided into two parts: Noyau Central which covers about 1,800km^2 and the rest of the reserve which is approximately 3,500km^2. The boundaries have been officially redefined. Currently, Noyau Centrale is the only gazetted protected area in Gabon; however, the area south of Noyau Centrale is proposed as an addition in 2001. The area south of Franceville towards Congo is also being proposed as a national park (White, questionnaire reply, 1998).

Threats to elephants remain from habitat destruction due to unchecked logging and illegal hunting both within and outside protected areas. A serious poaching threat was found in the western portion of the Lopé: approximately 100 poachers (nationals of Equatorial Guinea) were penetrating the reserve from Otoumbi to west Lopé using old logging roads (White, questionnaire reply, 1998). In addition, illegal elephant hunting is widespread throughout the country (White, questionnaire reply, 1998).

The logging legislation is currently under revision. The consequences of this are not yet known, but much of the remaining unlogged forest in Gabon was attributed as logging concessions in 1996 and 1997. Asian logging companies are now operating in Gabon and illegal elephant hunting is prevalent in the the south (Lahm, questionnaire reply, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Gabon

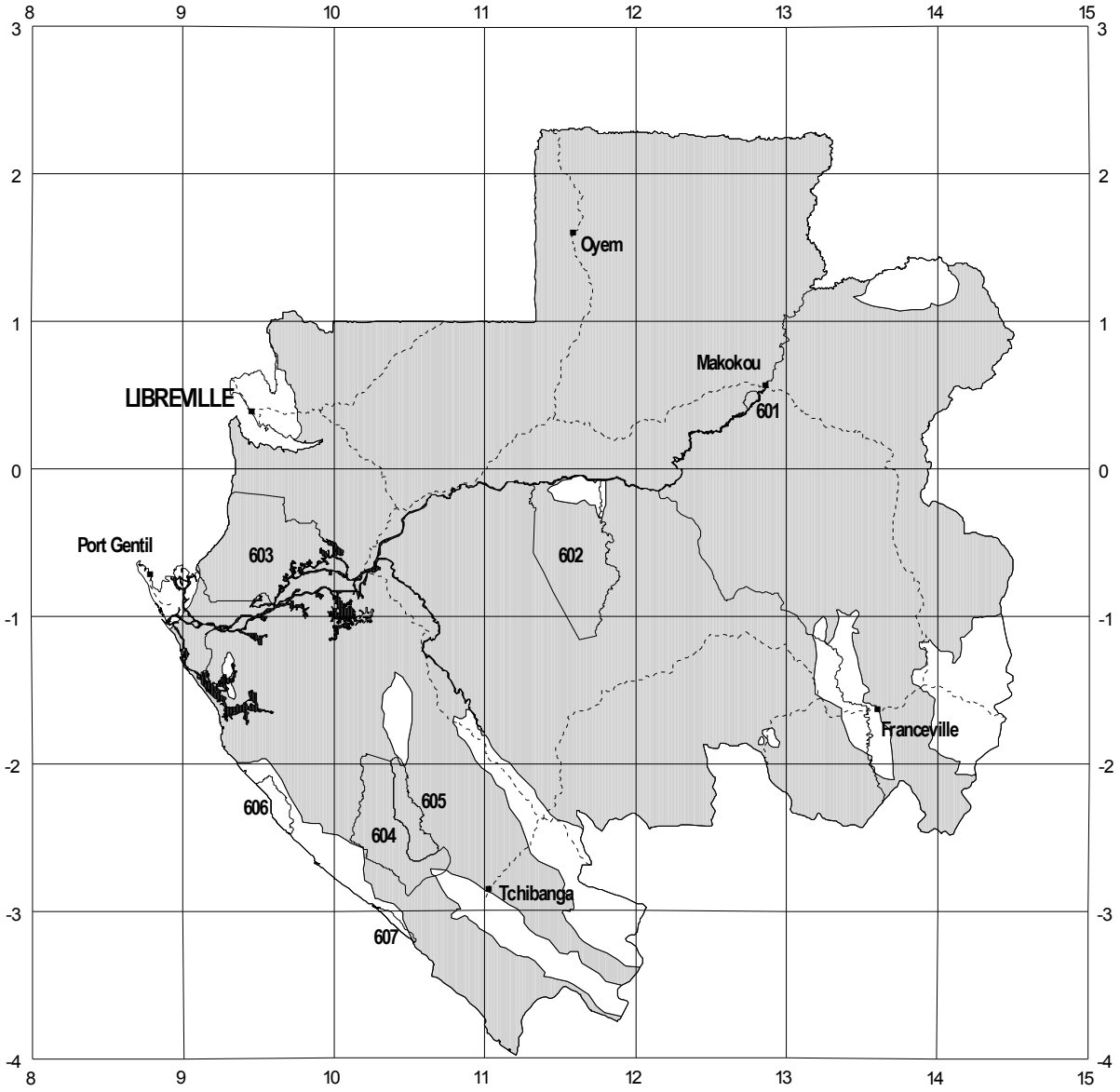
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Lopé Faunal Reserve	1991	5,000	4,500		0.90	White, pers. comm., 1998	IG3	D
301	Rest of Forest Elephant Range	1988	222,627	53,294	20,218	0.24	Barnes *et al*., 1995a	DC2	E
302	Gamba	1998	10,485	3,000	1,000*	0.29	Walsh, pers. comm., 1998	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR GABON

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	7,500	1,000
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	53,294
TOTAL		**0**	**0**	**7,500**	**54,294**

PROTECTED AREAS AND ELEPHANT RANGE IN GABON



LEGEND

- Town
- Road
- River
- Lake
- 602 Protected Area
- Elephant Range

Scale 1 : 5,500,000

KEY TO PROTECTED AREAS

Strict Nature Reserve
601 Ipassa-Makokou

Faunal Reserve
602 Lope
604 Monts Doudou
605 Moukalaba-Dougoua
606 Petit Loango
607 Ouanga Plain

Presidential Reserve
603 Wonga-Wongue

N

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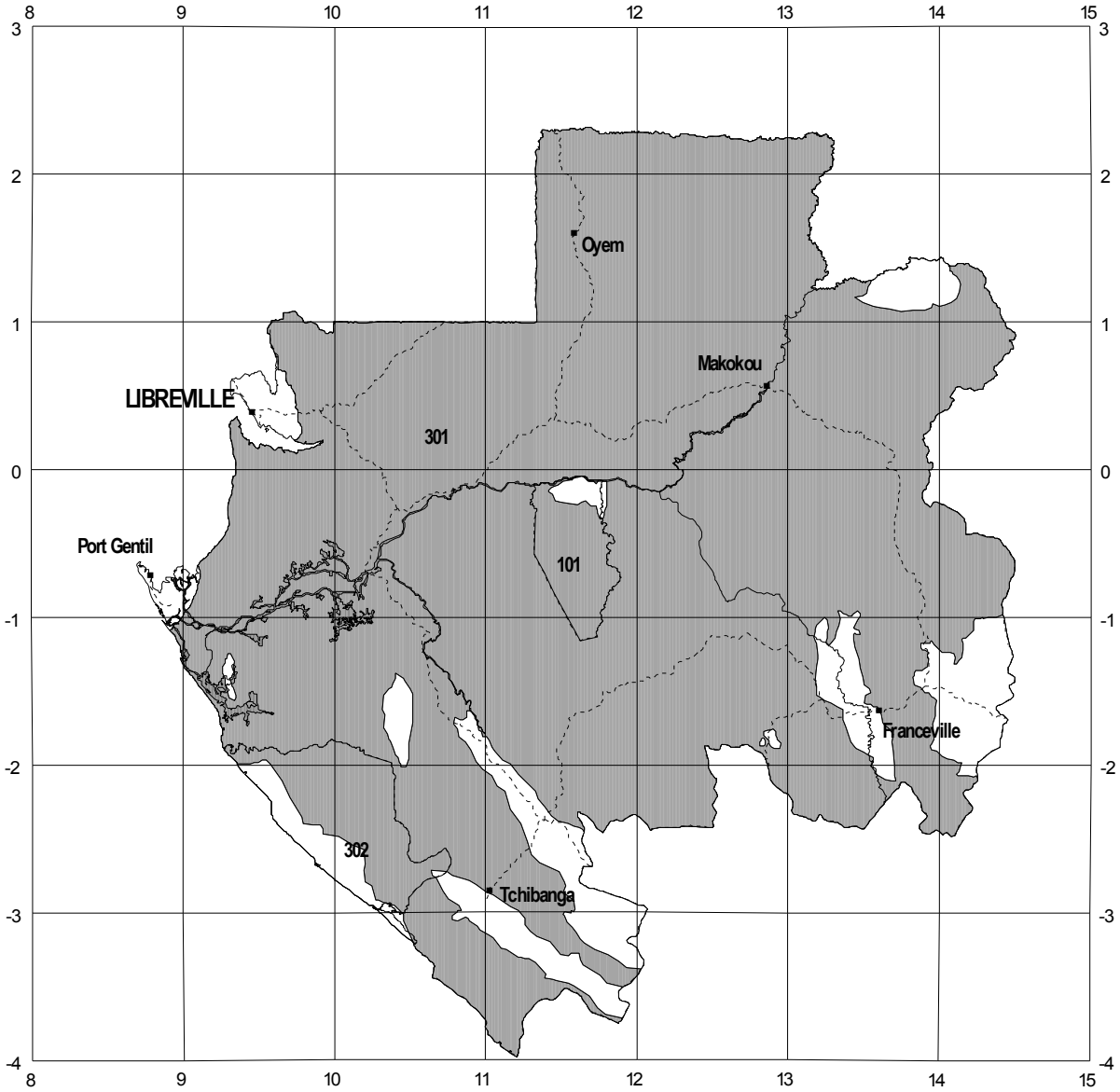
SURVEY ZONES AND ELEPHANT RANGE IN GABON



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 5,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Lopé Faunal Reserve	4500
301	Rest of Forest Elephant Range	53294
302	Gamba	3000

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EASTERN AFRICA

EASTERN AFRICA

Eastern Africa supports a large proportion of the elephants remaining on the continent and slightly less than 30% of the remaining elephant range (Figure 2). The majority of elephants inhabit savanna but a few small populations live in forest. The region continues to experience political turmoil, with three range states experiencing civil war in recent years (Somalia, Sudan and Rwanda). There is also cross-border conflict currently occurring between Eritrea and Ethiopia. These civil disturbances have made it difficult for wildlife authorities or independent researchers to carry out surveys, and consequently there is no new information on the status of elephant populations for Sudan and Somalia.

In this edition of the AED, Eastern Africa has a total of 72 survey zones, 56 of which have been surveyed between 1995 and 1998. A large proportion of the elephant estimates for the region are categorised as **Definite** (Figure 7) because most surveys are aerial counts of populations living in savanna habitat. There have not been any reports of large-scale poaching incidents in the region over the past three years.

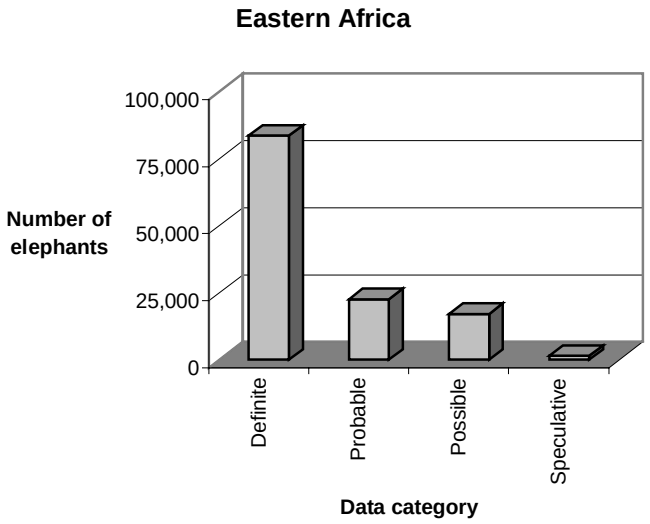
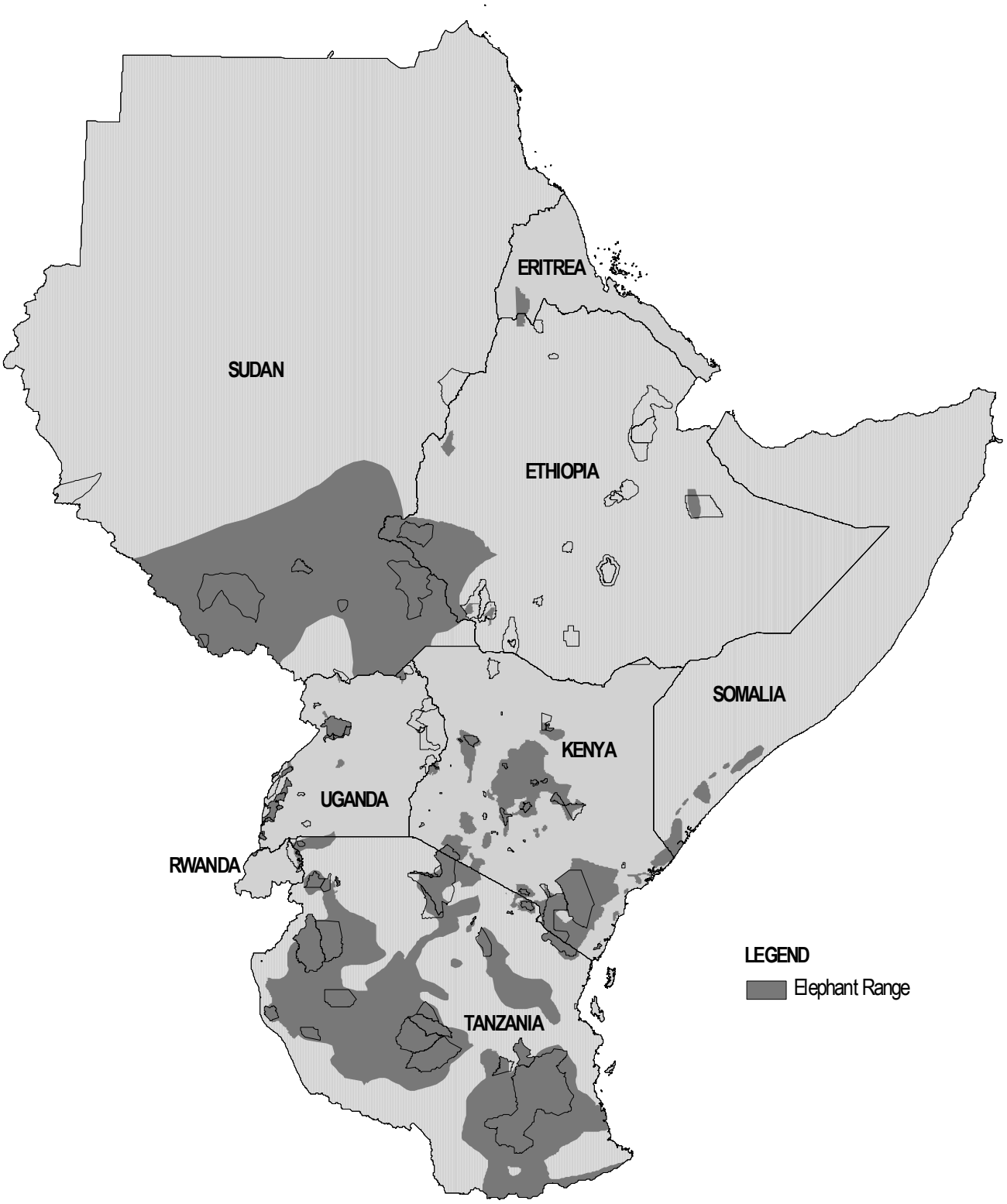


Figure 7. Elephant estimates by category for Eastern Africa.

SUMMARY OF ELEPHANT ESTIMATES IN EASTERN AFRICA

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
EASTERN AFRICA	Eritrea	2	0	0	0	121,320	2,967
	Ethiopia	321	0	0	985	1,127,,127	59,717
	Kenya	14,364	11,350	4,882	100	582,650	112,988
	Rwanda	39	0	20	10	26,340	1,019
	Somalia	0	0	130	120	637,660	11,783
	Sudan	0	0	0	0	2,505,810	404,908
	Tanzania	67,416	12,196	12,078	0	945,090	458,315
	Uganda	215	565	1,662	280	236,040	11,872
TOTAL		**83,770**	**22,698**	**17,216**	**1,495**	**6,182,037**	**1,063,569**

PROTECTED AREAS AND ELEPHANT RANGE IN EASTERN AFRICA



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SURVEY ZONES AND ELEPHANT RANGE IN EASTERN AFRICA

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ERITREA

General Statistics

Country area:	121,320 km^2
Range area (% of country):	2,967km^2 (2%)
Protected area coverage (% of country):	0%
Protected range (% of range in protected areas):	0%

Range

Historical evidence indicates that elephants once roamed over a considerable portion of Eritrea (Yalden *et al.*, 1986) but now they are restricted to an extremely small zone in western Eritrea, the Gash-Setit Province. The range displayed in this update is equal to the survey zone in Litoroh's (1997a) aerial survey because it was difficult to define the range boundary with so few elephants seen and in the absence of clear elephant signs. Litoroh (1997a) also noted that the elephants mostly move along the Gash and Tekezze rivers and to the north of Maiakota.

Surveys and data

A medium-intensity aerial total count of Eritrea's only known elephant population, in Gash-Setit on the border between Ethiopia and Eritrea, was conducted in 1996. Only two elephants were seen, together with six elephants and two carcasses on the Ethiopian side of the border (Litoroh, 1997a). This was much lower than the previous estimate of 70 to 100 suggested following a reconnaissance survey in 1993 (Hagos, 1993). No elephants or their signs were found in the nearby Sheraro area.

Cross-border movements

Litoroh's (1997a) survey confirmed that the range of Eritrea's small elephant population extends into Ethiopia.

Issues

The return of 400,000 refugees from Sudan is cause for concern since they will settle on the Gash-Setit, which is the most fertile area in the Gash-Barka Zoba. The land will most likely be cleared for agriculture, thereby reducing elephant habitat. This will worsen the human-elephant conflict already in the area (Yohannes, questionnaire reply, 1998).

In January 1997 and April 1997 two elephants were killed in the River Gash-Setit, near a town called Haicota where bananas are cultivated (Yohannes, questionnaire reply, 1998). It is likely that these elephants were the same ones seen in Litoroh's (1997a) survey. If this is the case, the small elephant population in Eritrea may be unviable and on the verge of extinction.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

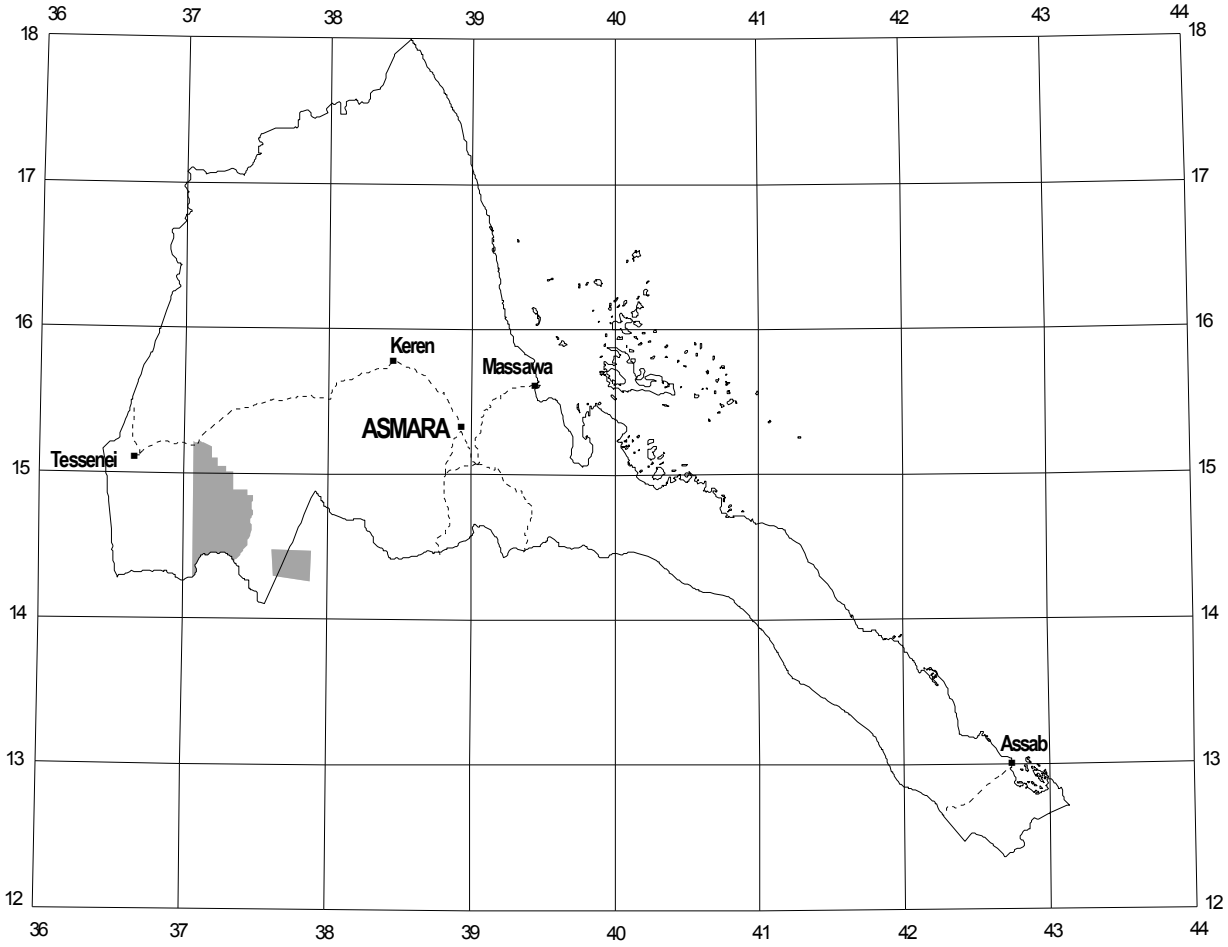
Eritrea

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
201	Gash-Setit	1996	2,950	2		0.00	Litoroh, 1997a	AT2	A

SUMMARY OF TOTALS FOR ERITREA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	2	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	0
TOTAL		**2**	**0**	**0**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN ERITREA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 6,000,000

KEY TO PROTECTED AREAS

There are no protected areas in Eritrea

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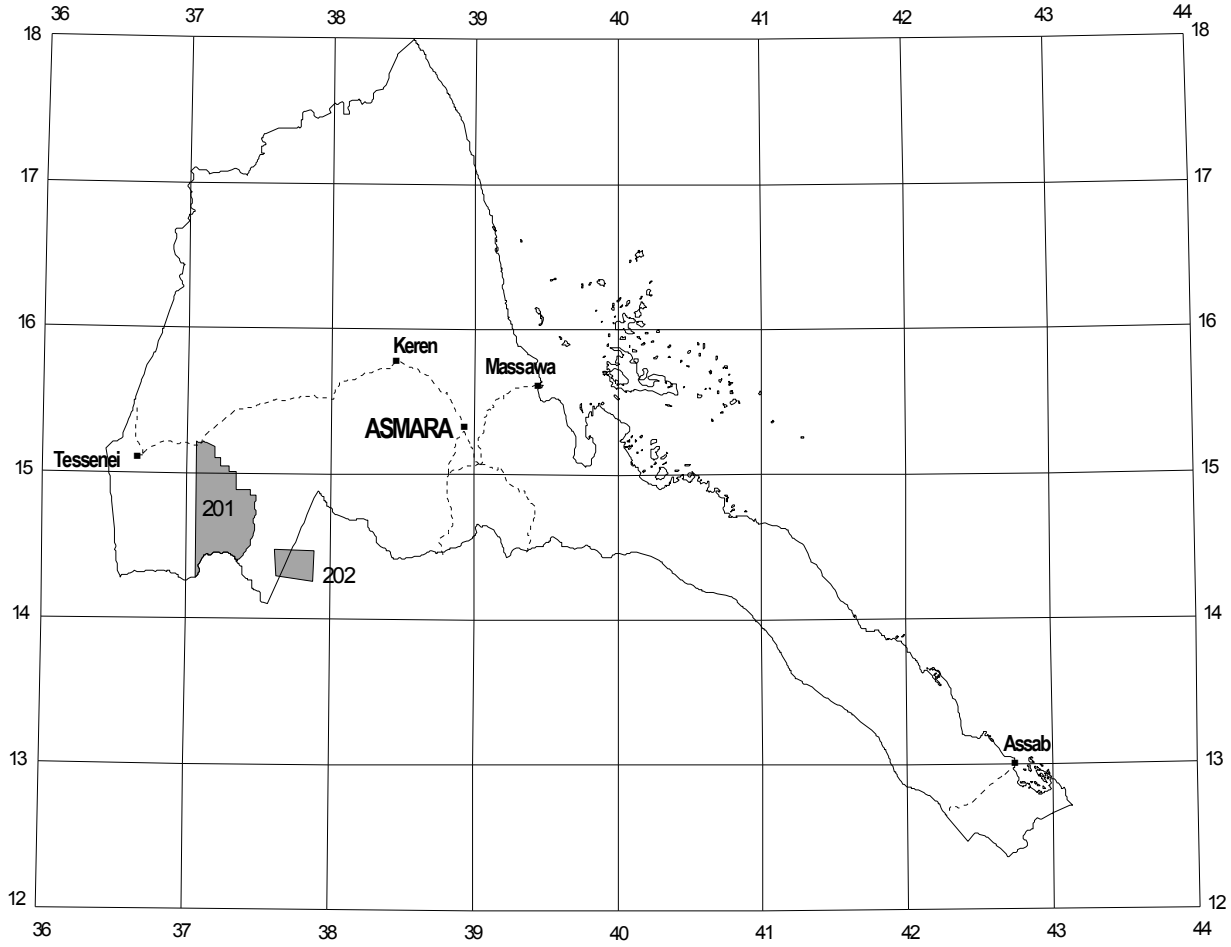
SURVEY ZONES AND ELEPHANT RANGE IN ERITREA



LEGEND

- Town
- Road
- River
- Lake
- 201 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 6,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Gash-Setit	2
202	Sheraro	0

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ETHIOPIA

General Statistics

Country area:	1,127,127 km^2
Range area (% of country):	59,717km^2 (5%)
Protected area coverage (% of country):	5%
Protected range (% of range in protected areas):	16%

Range

Increased human settlement in the southwest has excluded elephants from areas which were previously their range. The extent of range in the Omo-Mago area has been reduced since the previous update (Tekle, pers. comm., 1998). A reconnaissance flight indicated that the area between the Omo West Controlled Hunting Area and the Sudanese border made unsuitable elephant habitat because of its montane grassland and the presence of many Sudanese People Liberation Army (SPLA) camps (Thouless, 1995a). It is also believed that elephants no longer occur in the Ameya Bonga area (Abdi, pers. comm., 1998), although 47 animals were seen there in 1990 (Allen-Rowlandson, 1990). Since no signs of elephants were observed in the Borana Controlled Hunting Area during an aerial survey in 1995 (Thouless, 1995a), this range has also been removed.

Surveys and data

Aerial sample counts were carried out in Omo and Mago National Parks in February 1996 (Graham *et al*., 1996) and in February 1997 (Graham *et al.*, 1997). No elephants were seen within the transects and therefore no elephant estimates could be calculated. However, 250 elephants were seen outside the transects in the 1997 survey, providing a minimum estimate for the area. The survey is treated as a low intensity aerial total count for analysis. In 1994, 657 elephants were seen in an aerial total count (Lamprey, 1994), but because of the different techniques used, no direct comparison could be made between the surveys. However, Graham *et al*. (1997) believe that the elephant population in Omo and Mago National Park is declining because of illegal hunting.

There have been no surveys of the elephant population in the southwestern forests since those of Manspeizer in 1992 (Manspeizer, 1994). Approximately 8% of the southwest forest area (including the Mizan Teferi area) was surveyed by helicopter, while qualitative information on elephant signs was also collected from the ground. Although elephant signs were frequently recorded, only 14 individuals were spotted from the air (Manspeizer, 1994) and no overall population estimate was calculated to replace the 1990 estimate of 1,000 for the Akobo River – Mizan Teferi area provided by Allen-Rowlandson (1990). However, the population estimate for this area has been reduced from 1,000 to 500 (Abdi, pers. comm., 1998), but the reduction is not based on new survey data and has been categorised as a guess. Carrying out intensive ground surveys of this area remains a priority, since it may hold in excess of 50% of the Ethiopian elephant population.

There is still believed to be an elephant population in Gambella National Park, despite human settlement within the Park, and 13 elephants were seen during an aerial survey in 1990 (Allen-Rowlandson, 1990). A reconnaissance flight was flown in 1996 (Henshaw, in litt. to Antelope Survey Report, 1997) but no further details were obtained and the estimate of 150 is considered as an other guess.

A series of UNDP-funded aerial transect counts of game reserves and controlled hunting areas in the south and northeast were carried out in 1995 on behalf of the Ethiopian Wildlife Conservation Organisation (EWCO) (Thouless, 1995a; 1995b). The main purpose of these surveys was to investigate the status of ungulate populations, so the major elephant ranges were not covered. Elephants were seen however, in Omo West Controlled Hunting Area, just outside the western boundary of Omo National Park. The Borana Controlled Hunting Area was also surveyed but no elephants or recent signs of elephant feeding were observed.

A medium-intensity aerial total count of the Gash-Setit area was carried out in 1996 and six elephants were seen (Litoroh, 1997a), so the survey zone has been added to the range map.

The elephants in the Babille Valley, in the highlands south of Harar, constitute the only surviving population of the subspecies *Loxodonta africana orleansi* (Largen and Yalden, 1987). Their taxonomic status has not been confirmed, but they do form an isolated, ecologically distinct population. They appear to be mainly confined to the riverine forest along the Erer valley, although it is believed that they sometimes move south towards Wadi Shebelle (Demeke, pers. comm., 1998). There continues to be conflict between these elephants and farmers in the northern section of the valley, where 65 elephants were seen during an operation designed to chase elephants out of the farming areas in October 1997 (Tekle, pers. comm., 1998). The estimate is therefore recorded as an informed guess with 65 contributing to the **Definite** category.

A new estimate of 200 elephants for the Dabus Valley Controlled Hunting Area was provided on the basis of comments from game scouts (Abdi, pers. comm., 1998).

Cross-border movements

There are unlikely to be any large-scale cross-border movements of elephants between Ethiopia and neighbouring countries. The Gash-Setit population occurs on the border with Eritrea but consists of a very small number of animals (Litoroh, 1997a). Elephants may travel between Ethiopia and Sudan in the Gambella area and further south. However, the presence of camps of armed refugees in the border area makes this unlikely. There is also a possibility that elephants move between Kenya and Ethiopia to the east of Moyale but there has been no definite information on the presence of elephants on either side for many years.

Issues

There is limited protection of elephants within protected areas but none outside and Demeke (1997) suggests that more reserves are needed. Elephant population and range are decreasing due to a number of factors, including human expansion – often encroaching onto elephant migratory routes - unsustainable land-use practices, decentralisation, minimal prioritisation given to wildlife conservation by the government and limited power of EWCO (Demeke, 1997). Furthermore, poaching for ivory continues in the south and southwest (Demeke, 1997)and ivory is still for sale in the capital, Addis Ababa.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Ethiopia

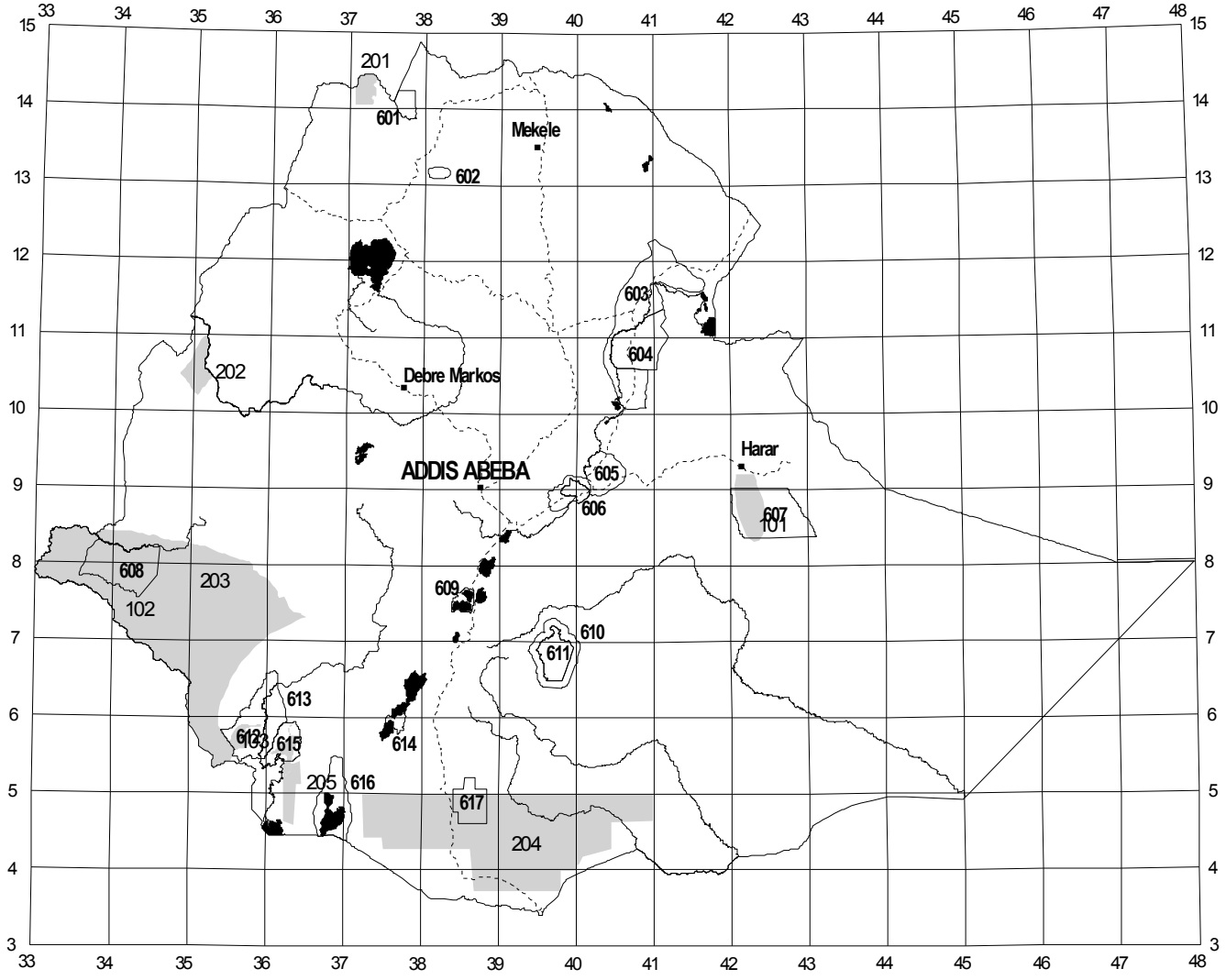
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Babille Elephant Sanctuary	1998	6,982	65	135*	0.00	Tekle, pers. comm., 1998	IG3	D
102	Gambella National Park	1998	5,061	150		0.03	Abdi, pers. comm., 1998	OG3	E
103	Mago and Omo National Park and Tama Wildlife Reserve	1997	9,499	250		0.03	Graham *et al*., 1997	AT3	A
201	Gash-Setit	1996	1,135	6		0.00	Litoroh, 1997a	AT2	A
202	Dabus Valley Controlled Hunting Area	1998	2,127	200		0.09	Abdi, pers. comm., 1998	OG3	E
203	Mizan Teferi Controlled Hunting Area	1998	3,160	500		0.16	Abdi, pers. comm., 1998	OG3	E

*Range of Informed Guess

SUMMARY OF TOTALS FOR ETHIOPIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	256	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	65	0	0	135
E	Other Guesses	0	0	0	850
TOTAL		**321**	**0**	**0**	**985**

PROTECTED AREAS AND ELEPHANT RANGE IN ETHIOPIA



LEGEND

- Town
- Road
- River
- Lake
- 602 Protected Area
- Elephant Range

Scale 1 : 10,500,000

KEY TO PROTECTED AREAS

National Park
602 Simien Mountains
604 Yangudi-Rassa
606 Awash
608 Gambella
609 Abijatta-Shalla Lakes
611 Bale Mountains
612 Omo
614 Nechisar
615 Mago

Wildlife Reserve
601 Shire
603 Mille-Sardo
605 Awash
610 Bale
613 Tama
616 Chew Bahr

Sanctuary
607 Babille Elephant
617 Yabello

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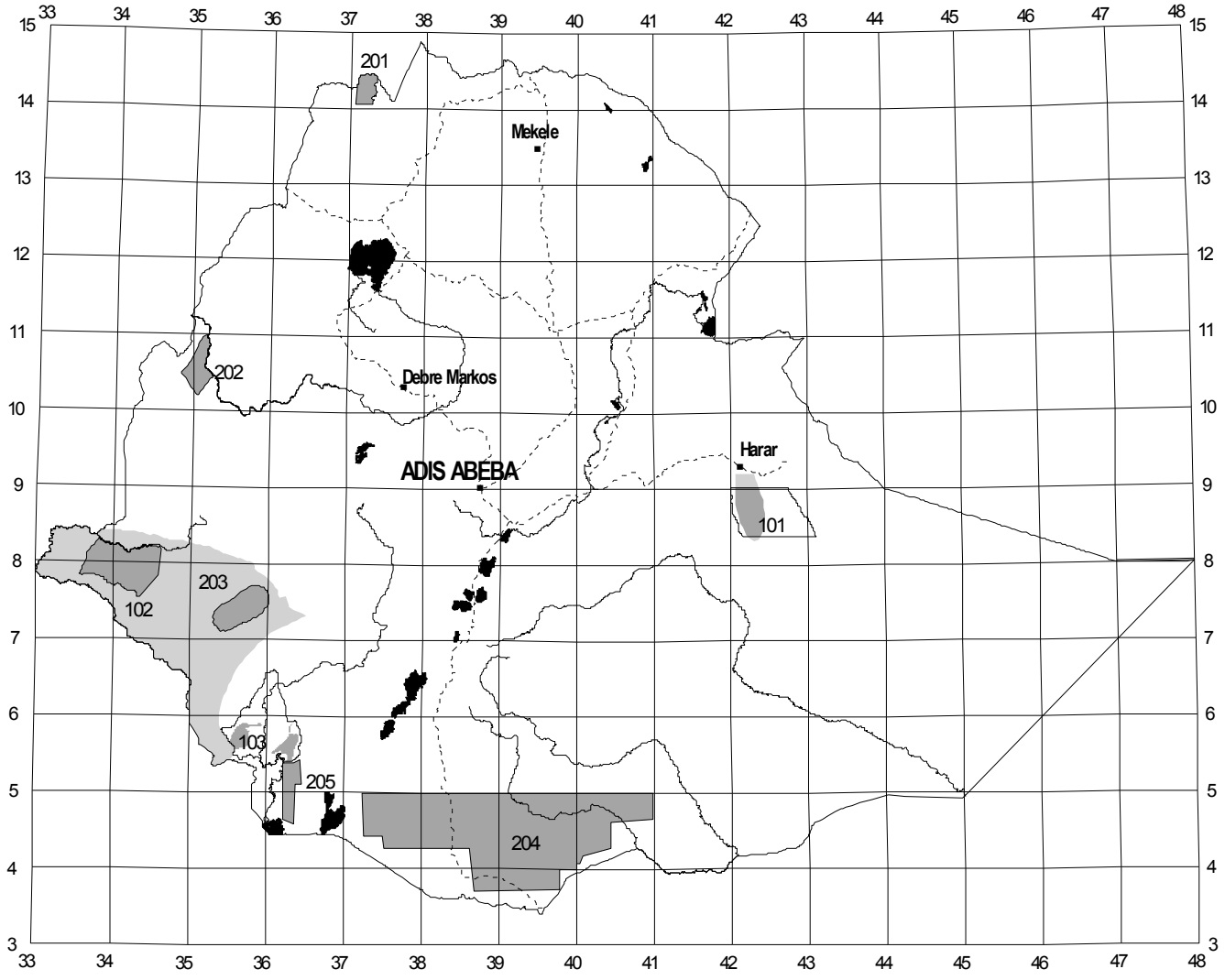
SURVEY ZONES AND ELEPHANT RANGE IN ETHIOPIA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 10,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Babille Elephant Sanctuary	65
102	Gambella National Park	150
103	Mago & Omo National Park and Tama Wildlife Reserve	250
201	Gash-Setit	6
202	Dabus Valley Controlled Hunting Area	200
203	Mizan Teferi Controlled Hunting Area	500
204	Borana Controlled Hunting Area	0
205	Murule Controlled Hunting Area	0

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KENYA

General Statistics

Country area:	582,650 km^2
Range area (% of country):	136,963km^2 (23%)
Protected area coverage (% of country):	6%
Protected range (% of range in protected areas):	21%

Range

Elephant range was depicted using information provided by the Kenya Wildlife Service (KWS), augmented by ten years of survey data from the Department of Resource Surveys and Remote Sensing (DRSRS) for all 18 rangeland districts. Areas where elephants have been seen by DRSRS over the past ten years were overlaid on the map with the range estimates from KWS. Areas previously depicted as range, but with no records of elephant sightings for ten years, were removed from the map.

Changes in elephant range since the last update include the removal of an area to the north of Marsabit National Park and in the Losai Reserve, which consist of dry volcanic lava country (Thouless, pers. comm., 1998). Isolated areas of former elephant range, without estimates, close to the borders with Uganda, Sudan, Ethiopia and Somalia, have also been removed. It is possible that there are still elephants in these remote areas, particularly in the west, where elephants may cross into Kenya from Kidepo National Park in Uganda, but there has been no information for many years.

Surveys and data

Since 1995, KWS has carried out a series of dung counts in forest areas including the Loroki Forest, the Imenti Forest, the Mau Forest, Arabuko Sokoke Forest, the Transmara Forests, Mount Elgon, Mount Kenya and the Aberdares range (Bitok, 1997; Bitok *et al*., 1997; Njumbi *et al*., 1995; Litoroh and Mwathe, 1996a; Bitok *et al*., 1998; Wamukoya *et al*., 1997; Mulama *et al*., 1996; Omondi *et al*., 1998a). The reliability of estimates from these surveys is not high because the sampling was not random and on-site defecation/ dung decay studies were not included. These areas were all surveyed previously in the early to mid-1990s. The current population estimates for Mau Forest and Mount Elgon are much higher than the previous ones, but the recent surveys are based on more extensive fieldwork.

KWS also conducted low intensity aerial total counts of the Nasolot/South Turkana population, Meru National Park and its surrounding dispersal area and parts of Lamu District (Muriuki *et al*., 1997; Mwathe, 1998; Litoroh and Mwathe, 1996b; Litoroh, 1996b). No elephants were found inside Meru National Park during this survey, because the population tends to move in a single, large herd following heavy poaching in the 1980s, and was in its dispersal area at the time of the survey. A high intensity survey of the Shimba hills coastal forest population was carried out by helicopter. Despite the difficulties associated with aerial surveys in forest areas, a higher population estimate was reached than from an earlier dung count (Litoroh, 1997b).

The regular series of total aerial counts of the Mara ecosystem flown as part of the WWF Mara monitoring programme have continued with three surveys since the last AED update (Muriuki and Mulama, 1997; Muriuki *et al*., 1998a; Muriuki *et al*., 1998b). DRSRS flew two aerial sample surveys of Laikipia District in 1997, but the estimate from the Mpala Research Centre's aerial total survey in 1996 has been utilised (Mpala Research Station, 1996). Movements of the Laikipia-Samburu population continue to be monitored by radiotelemetry (Thouless, 1998). The Amboseli Elephant Project, initiated in the 1970s, still maintains individual registration records on the Amboseli elephant population, which is now estimated at 980 (Moss, pers. comm., 1998). An aerial total count of the Tsavo ecosystem planned for early 1999 will update the estimate from the previous aerial total count provided by Douglas-Hamilton *et al.* (1994). DRSRS conducted an aerial sample survey of the Tsavo ecosystem in 1997 (DRSRS, 1997) but the more definitive 1994 estimate has been retained in the database.

DRSRS surveys the rangeland districts of Kenya using systematic reconnaissance flights. The withdrawal of World Bank funding means that their activities have had to be scaled down. However, counts have been carried out in the following districts since 1995: Kajiado, Kilifi, Kwale, Laikipia, Lamu, Machakos, Narok, Samburu, Taita Taveta and Isiolo (DRSRS, 1997). Both DRSRS and KWS estimates for elephant numbers and distribution over several years in the coastal districts have been summarised by Litoroh (1997c). In this update, DRSRS survey figures have been used for Samburu District, but not for the other districts, for which more precise data is available. The Isiolo District survey was not used because it overlaps with the survey for the Bisinadi National Reserve by Mwathe (1998). However, the Isiolo survey did have an estimate of 346 elephants (DRSRS, 1997). On the basis of a ground reconnaissance, an estimate has been provided for the Nguruman Hills, for which there was previously no data (Chege, 1998).

Cross-border movements

Cross-border movements occur mainly across the Kenya - Tanzania border, in the Serengeti - Mara, Tsavo - Mkomazi and Amboseli - Kilimanjaro ecosystems. Movements of elephants from the Amboseli ecosystem across the Tanzanian border have been demonstrated using GPS radio-tracking (Douglas-Hamilton, 1998) and by Poole and Reuling's (1997) study, during which elephants known from the Amboseli population were seen in Tanzania. There may also be cross-border populations shared with Somalia near Kenya's northeast coastline, and possible movement between northern Kenya and Ethiopia. If so, the number of elephants involved is probably small. Limited cross-border movements may occur between Kenya and Uganda on Mount Elgon, and in the vicinity of Kidepo National Park in Uganda. Reports from Uganda, however, indicate that there are no more elephants on the Ugandan side of Mount Elgon (Michelmore, pers. comm., 1998).

Issues

Kenya's elephants occur in both savanna and forest habitats. The largest savanna populations are those of the Tsavo ecosystem and the Samburu - Laikipia area (which also includes some highland forests). The main highland forest populations are those of the Aberdares range and Mount Kenya, and there are other smaller, isolated forest populations. Small populations still occur in coastal forest areas.

Following substantial declines in the 1970s and 1980s, most elephant populations in Kenya are believed to be stable or increasing. Levels of illegal killing are still low, with an average of 46 elephants poached per year being reported to KWS between 1992 and 1997 (Waithaka, 1997). However, KWS has experienced financial difficulties as a result of reduced tourist income following a decline in security and damage to infrastructure during the exceptionally heavy rains of 1997 to 1998, and staff retrenchments may have affected the organisation's capacity to carry out effective law enforcement and monitoring. To some extent increasing levels of community participation in conservation activities may have compensated for the reduced law enforcement capacity.

In some areas habitat loss coupled with escalating conflict with humans are placing elephant populations under increased threat. Clearing and degazettement of forest reserves is an increasing conservation and political problem, with particular pressure on the Mount Kenya, Mau, and Aberdares forests. The erection of elephant-proof fencing has limited encroachment in some areas, as well as lowering the level of crop-raiding. The fence along the eastern boundary of the Aberdares forest has been extended, and the fence around the Shimba Hills has been renovated. In general, levels of conflict between people and elephants continue to be a major conservation and political issue, because of the economic and social costs.

A side-effect of fencing is that local elephant densities may rise, and have a negative effect on overall biodiversity. This is a particular problem in the Shimba Hills, which has a number of endemic plant species, which may be negatively affected by elephants (Höft and Höft, 1993; Omondi *et al.*, 1998b). Other Parks where concern has been expressed about local 'overpopulation' are Amboseli and the Aberdares. In other areas, such as the Tsavo ecosystem, elephant densities are still low compared to earlier levels.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Kenya

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Marsabit National Park	1998	142	500		3.50	Omondi, pers. comm., 1998	IG3	D
102	Nasalot and South Turkana National Reserve	1997	7,074	652		0.09	Muriuki *et al*., 1997	AT3	A
103	Meru National Park	1997	870	0		0.00	Mwathe, 1998	AT3	A
104	Masai Mara National Reserve	1998	1,510	1,000		0.66	Muriuki *et al*., 1998a,b	AT3	A
201	Matthews Range	1992	750	630	215	0.84	Reuling *et al*., 1992	DC2	C
202	Loroki Forest	1997	596	210	354	0.35	Bitok, 1997	DC3	C
203	Laikipia District	1996	7,000	2,436		0.35	Mpala Research Centre, 1996	AT3	A
204	Rimoi and Kamnarok National Reserve	1997	105	200		1.90	Muriuki *et al*., 1997	AT3	A
205	Bisanadi National Reserve and Dispersal Area	1997	2,025	360		0.18	Mwathe, 1998	AT3	A
206	Imenti Forest Reserve	1997	70	156	137	2.23	Bitok *et al*., 1997	DC3	C
207	Mau Forest Complex Forest Reserve	1995	1,267	1,003		0.79	Njumbi *et al*., 1995	DC3	D
208	Mwea National Reserve	1998	68	55		0.81	Manegene and Musoki, 1998	GT1	A
209	Masai Mara (Outside)	1998	1,978	450		0.23	Muriuki *et al*., 1998a,b	AT3	A
210	Nguruman	1998	2,197	150	50*	0.07	Chege, 1998	IG3	D

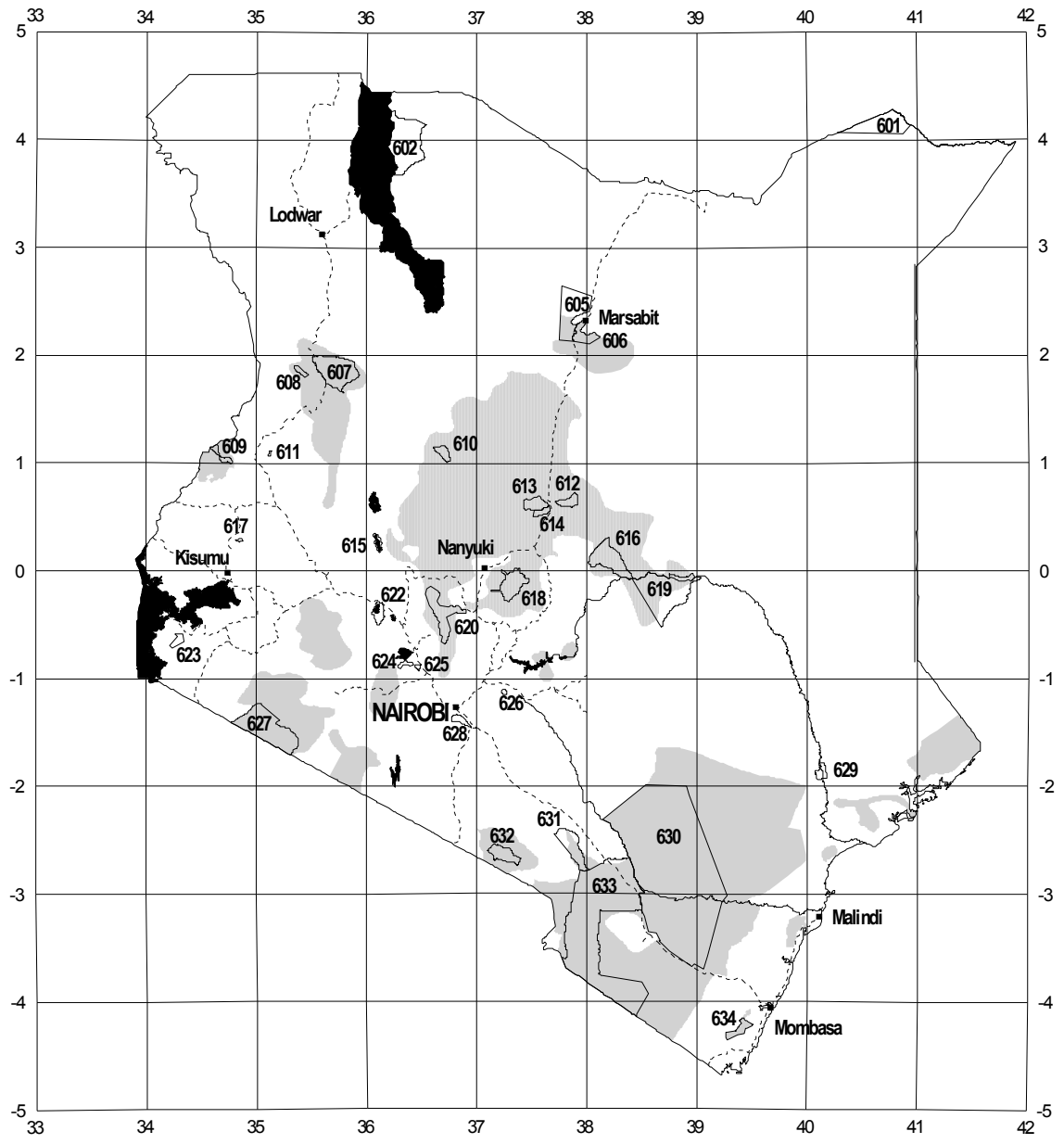
211	Lamu District	1996	5,964	150		0.03	Litoroh and Mwathe, 1996b	IG3	D
212	Arabuko Sokoke Forest Reserve	1996	415	100	50*	0.24	Litoroh and Mwathe, 1996a	DC3	D
213	Transmara Forests	1997	300	200	140	0.67	Wamukoya *et al*., 1997	DC3	C
301	Samburu District	1996	21,095	1,224	898	0.06	DRSRS, 1997	AS2	B
302	Mount Elgon National Park and Forest Reserve	1996	1,083	1,114	836	1.03	Mulama *et al*., 1996	DC3	C
303	Mount Kenya National Park and Forest Reserve	1998	2,810	4,022	1,083	1.43	Omondi *et al*., 1998a	DC2	C
304	Aberdare National Park and Forest Reserve	1998	1,030	4,120	1,596	4.00	Bitok *et al*., 1998	DC2	C
305	Tsavo Ecosystem	1997	38,300	7,371		0.20	Douglas-Hamilton *et al*., 1994	AT3	A
306	Amboseli Ecosystem	1998	392	980		2.50	Moss, pers. comm., 1998	IR1	A
307	Shimba Hills Ecosystem	1997	234	464		1.98	Litoroh, 1997b	AT1	A

* Range of Informed Guess

SUMMARY OF TOTALS FOR KENYA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	13,968	0	0	0
B	Aerial or Ground Sample Counts	326	898	898	0
C	Dung Counts	0	10452	2151	0
D	Informed Guesses	70	0	0	0
E	Other Guesses	0	0	1833	100
TOTAL		**14,364**	**11,350**	**4,882**	**100**

PROTECTED AREAS AND ELEPHANT RANGE IN KENYA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 7,500,000

KEY TO PROTECTED AREAS

National Park
601 Malka Mari
602 Sibiloi
603 Central Island
604 South Island
606 Marsabit
609 Mount Elgon
611 Saiwa Swamp
616 Meru
618 Mount Kenya
620 Aberdare
621 Ndere Island
622 Lake Nakuru
623 Ruma
624 Hells Gate
625 Longonot
626 Ol Donyo Sabuk
628 Nairobi
630 Tsavo East
632 Amboseli
633 Tsavo West

National Reserve
605 Marsabit
607 South Turkana
608 Nasolot
612 Shaba
613 Samburu
614 Buffalo Springs
615 Lake Bogoria
617 Kakamega
619 Kora
627 Masai Mara
629 Tana River Primate
631 Chyulu Hills
634 Shimba Hills

National Sanctuary
610 Maralal

N

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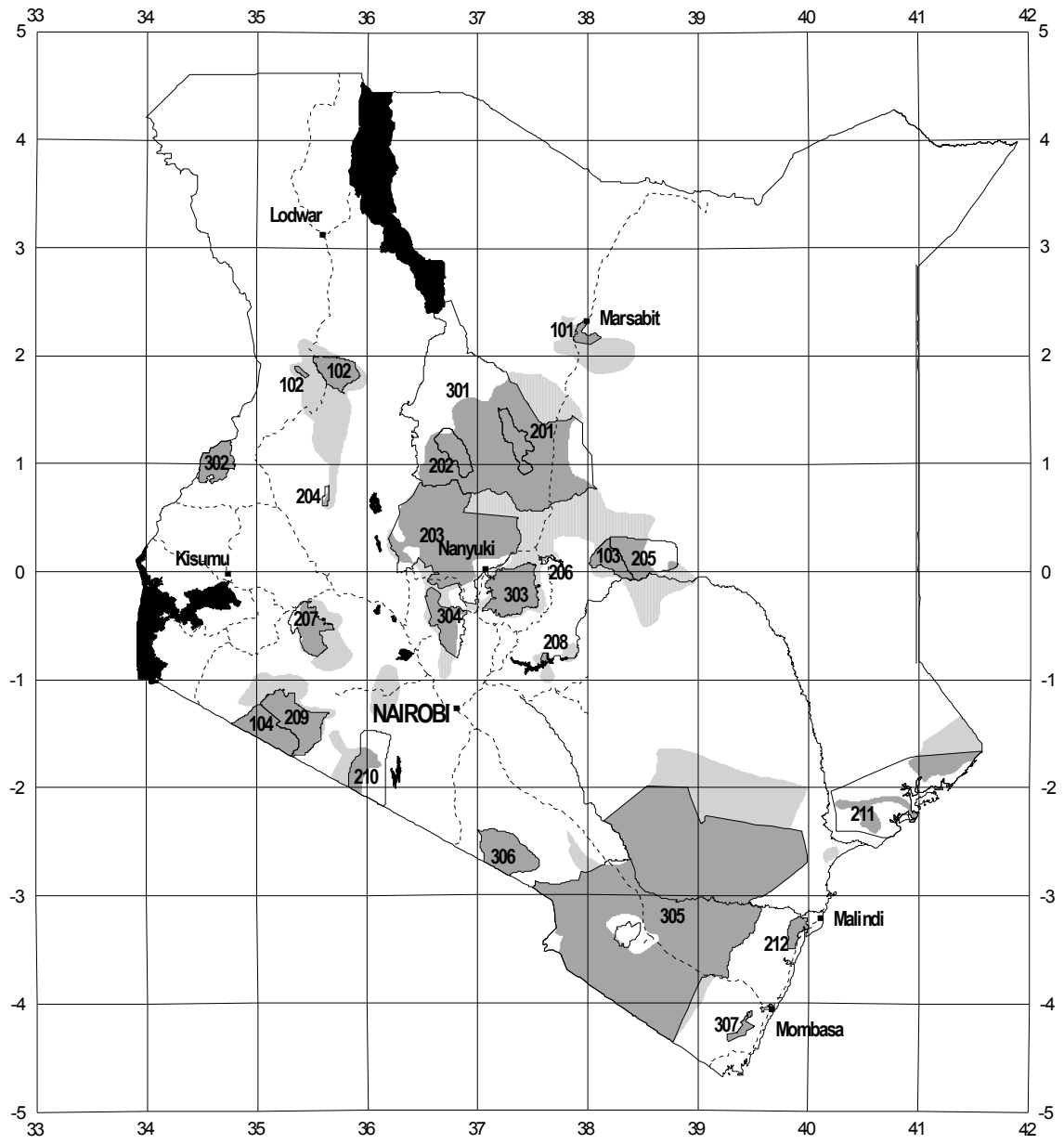
SURVEY ZONES AND ELEPHANT RANGE IN KENYA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 7,500,000

KEY TO ZONE NAMES
NP - National Park
NR - National Reserve
FR - Forest Reserve

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Marsabit NP	500
102	Nasalot and South Turkana NR	652
103	Meru NP	0
104	Masai Mara NR	1000
201	Matthews Range	630
202	Loroki Forest	210
203	Laikipia District	2436
204	Rimoi and Kamnarok NR	200
205	Bisanadi & Disperal Area	360
206	Imenti FR	156
207	Mau Forest Complex	1003
208	Mwea NR	55
209	Outside Masai Mara	450
210	Nguruman	150
211	Lamu District	150
212	Arabuko Sokoke FR	100
301	Samburu District	1224
302	Mt. Elgon NP and FR	1114
303	Mt. Kenya NP and FR	4022
304	Aberdare NP and FR	4120
305	Tsavo Ecosystem	8188
306	Amboseli Ecosystem	980
307	Shimba Hills Ecosystem	464

N

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RWANDA

General Statistics

Country area:	26,340km^2
Range area (% of country):	1,101km^2 (4%)
Protected area coverage (% of country):	10%
Protected range (% of range in protected areas):	100%

Range

Elephant range is limited to two areas, Volcans National Park in the north, and Akagera National Park on the eastern border with Tanzania. The elephant range for Nyungwe Natural Forest remains in the AED even though there have been no recent sightings of elephants. Bizimana (pers. comm., 1998) maintains that there are still elephants in the forest but that it is difficult to estimate their numbers as no work is being done.

Surveys and data

No new survey work has been done in Rwanda since the last update, partly as a result of civil unrest. However, Williams (pers. comm., 1998) has been doing some field work and although he has not carried out a survey, he has provided an estimate of about 40 elephants for Akagera National Park. This estimate is similar to the last count, an aerial total count, by Fourniret (1994).

Cross-border movements

It is possible that elephants move from their Rwandese range into Virunga National Park in DRC (Bizimana, pers. comm., 1998).

Issues

Rwanda has been severely affected by civil war during the past few years (Bizimana, pers.comm., 1998). The conflicts may already have affected the elephant populations, a possibility which needs to be ascertained through new survey work. The boundaries of the Akagera National Park are being changed to reduce the area of the park by 100 km^2. Meanwhile, cattle keepers, many of whom are well connected, have penetrated all regions of the 'new' park with their cattle (Williams, pers. comm., 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Rwanda

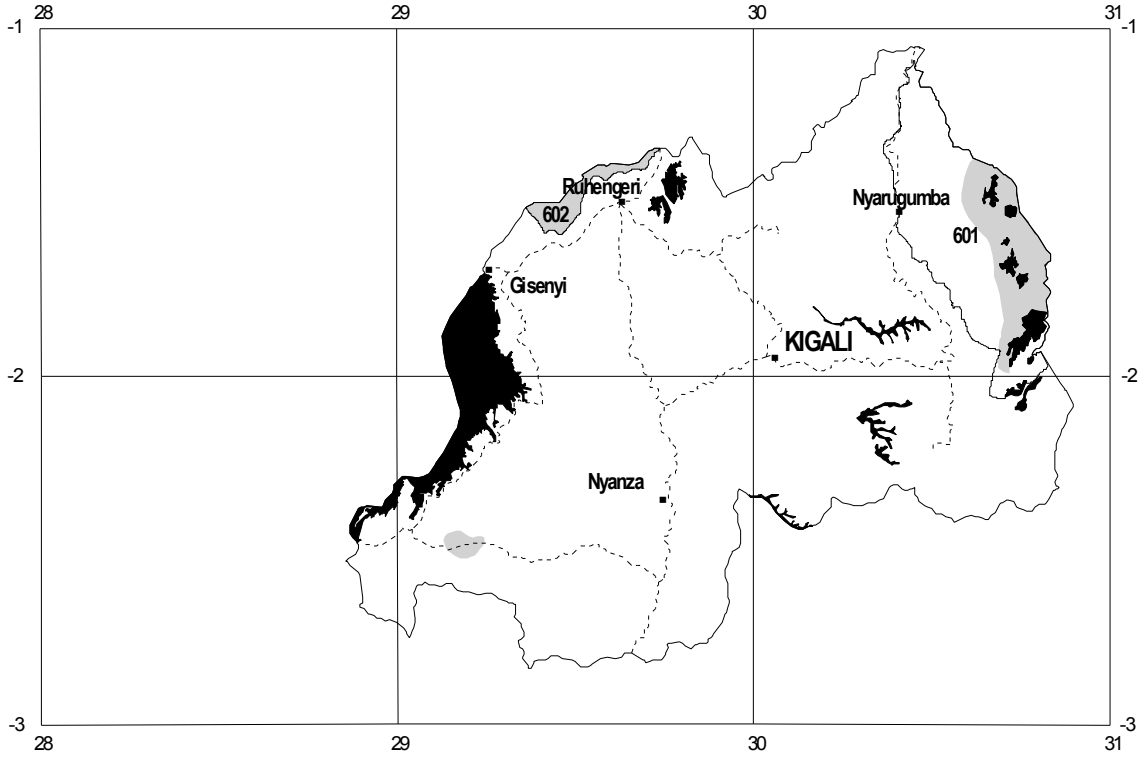
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Akagera National Park	1994	3,120	39		0.01	Fourniret, 1994	AT3	A
102	Volcans National Park	1989	150	20	10*	0.13	ORTPN, 1991	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR RWANDA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	39	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	20	10
E	Other Guesses	0	0	0	0
TOTAL		**39**	**0**	**20**	**10**

PROTECTED AREAS AND ELEPHANT RANGE IN RWANDA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 Akagera
602 Volcans

N

Scale 1 : 2,500,000

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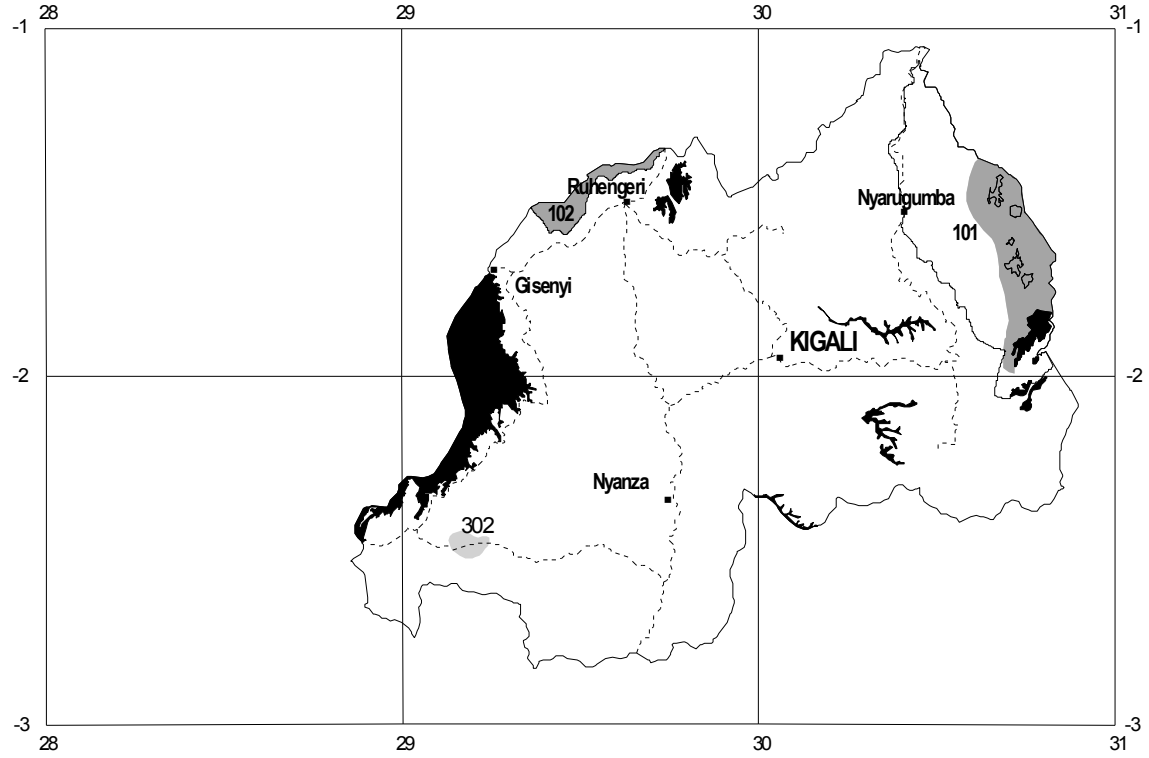
SURVEY ZONES AND ELEPHANT RANGE IN RWANDA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 2,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Akagera National Park	39
102	Volcans National Park	20
302	Nyungwe Forest Reserve	0

N

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SOMALIA

General Statistics

Country area:	637,660km^2
Range area (% of country):	11,783km^2 (2%)
Protected area coverage (% of country):	0%
Protected range (% of range in protected areas):	0%

Range

No change has been made to the map of elephant range since the last update. Range is depicted only in the southeast of Somalia - in three main portions along the coast - there being no information for the rest of the country.

Surveys and data

No new surveys or population estimates are available. The previous informed guesses by Bauer (questionnaire reply, 1995) have been retained in the absence of any new information. However, extreme caution should be used when interpreting these numbers, as the continuing civil conflict is likely to have had a negative impact on any remaining elephant populations.

Cross-border movements

Elephants in the southern corner of Somalia probably migrate frequently into and out of Kenya but information is lacking.

Issues

It is important to note that no new information is available on the elephant populations and the reliability of the information provided is unknown.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

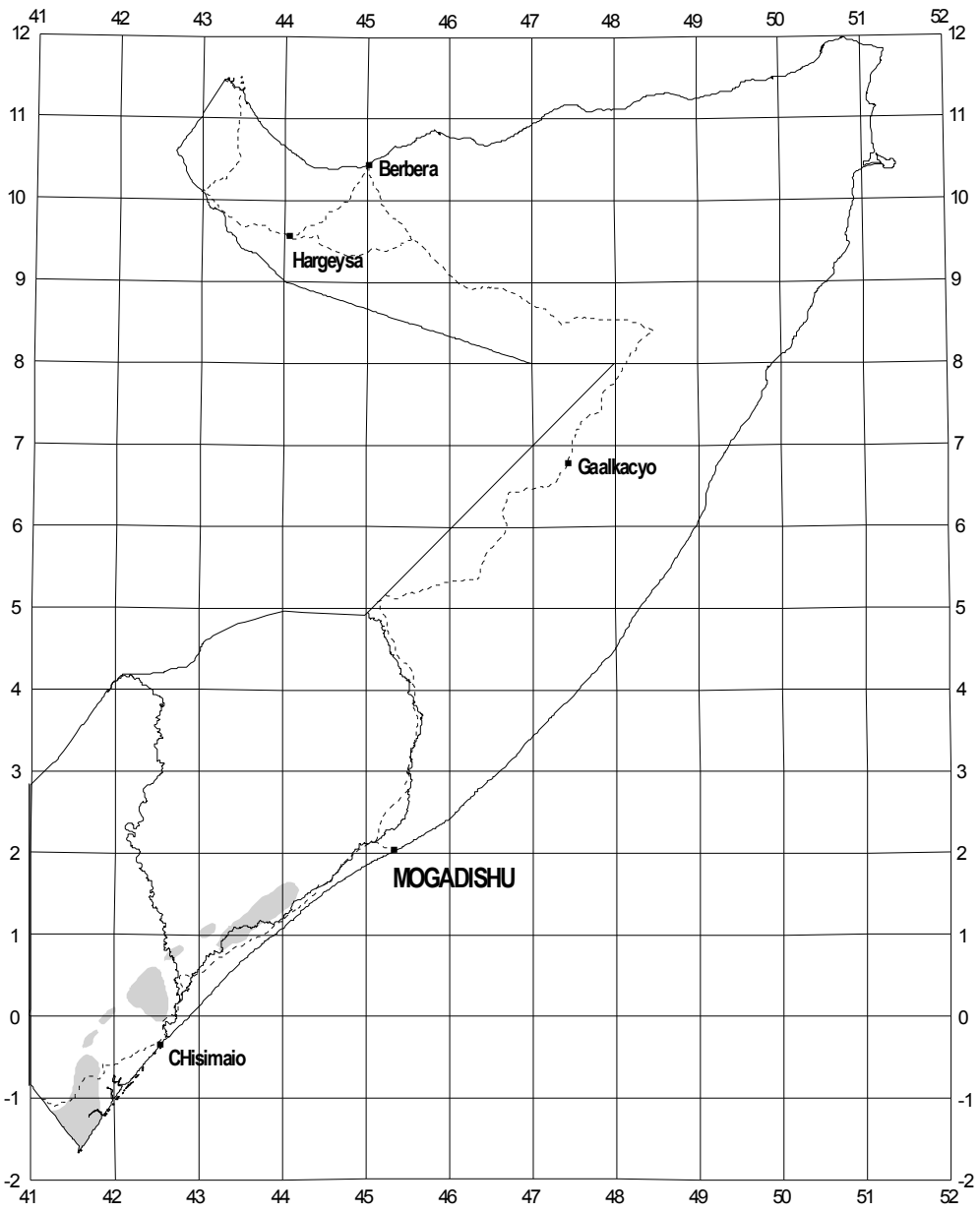
Somalia

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
201	Swamp	1995	850	30		0.04	Bauer, quest. reply, 1995	IG3	D
202	Far Wamo	1995	1,050	30		0.03	Bauer, quest. reply, 1995	IG3	D
203	Lag Badana Bushbush	1995	4,500	70		0.02	Bauer, quest. reply, 1995	IG3	D
204	Other Areas	1995		120			Bauer, quest. reply, 1995	OG3	E

SUMMARY OF TOTALS FOR SOMALIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	130	0
E	Other Guesses	0	0	0	120
TOTAL		**0**	**0**	**130**	**120**

PROTECTED AREAS AND ELEPHANT RANGE IN SOMALIA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 10,500,000

KEY TO PROTECTED AREAS

There are no protected areas in Somalia

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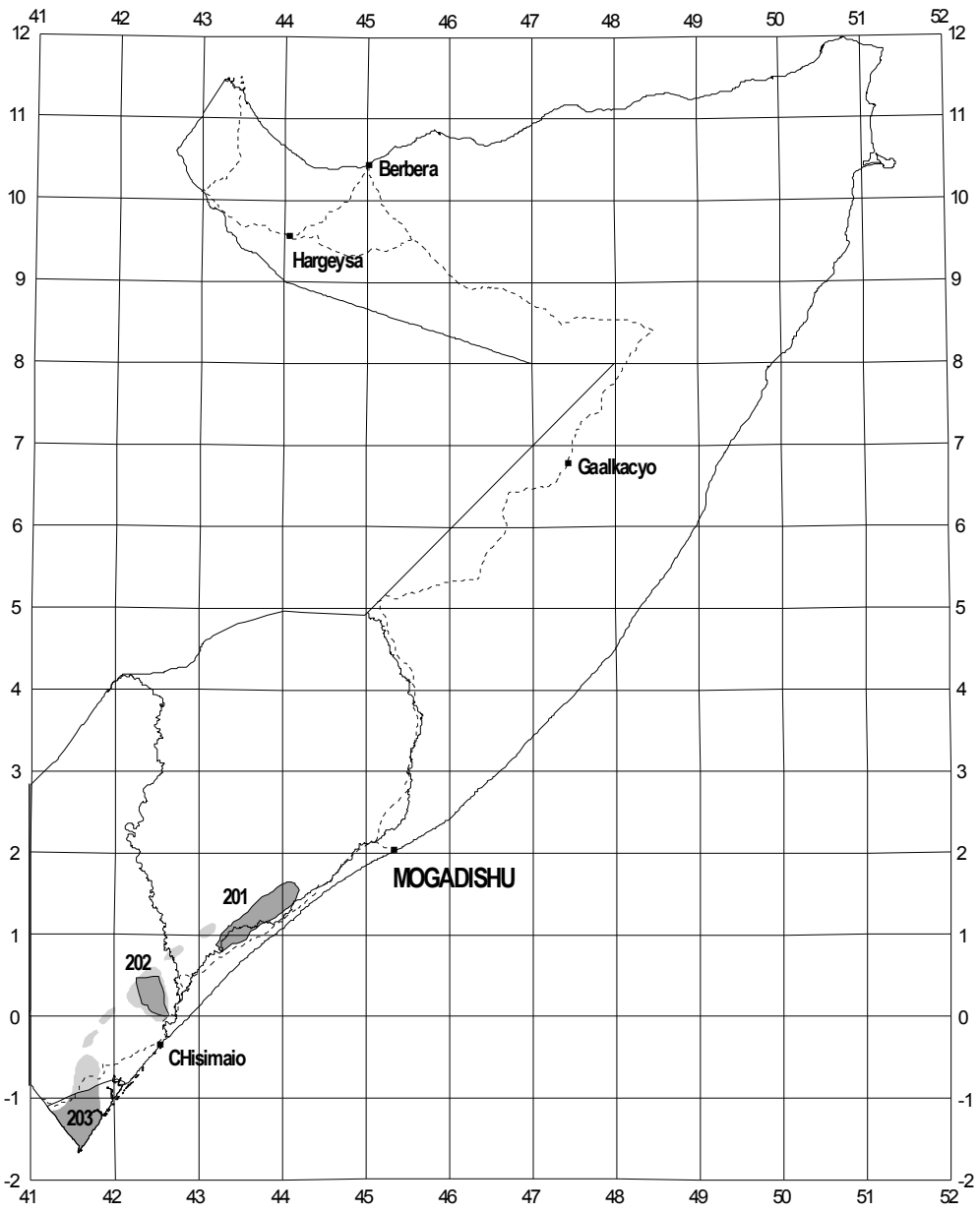
SURVEY ZONES AND ELEPHANT RANGE IN SOMALIA



LEGEND

- Town
- Road
- River
- Lake
- 201 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 10,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Swamp	30
202	Far Wamo	30
203	Lag Badana Bushbush	70

N

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SUDAN

General Statistics

Country area:	2,505,810km^2
Range area (% of country):	384,273km^2 (15%)
Protected area coverage (% of country):	2%
Protected range (% of range in protected areas):	9%

Range

Because of the civil war separating north from south, and general instability in Sudan over many years, relatively little is known about current elephant distribution. However, two changes to the range map have been made, based on observations by Winter (pers. comm., 1998) and Hashim (pers. comm., 1998). Winter (pers. comm., 1998) recorded signs of elephants throughout southern Sudan during his ten years of piloting, and suggested that there should be no division of range between the east and west banks of the Nile. According to Hashim (pers. comm., 1998), elephants are no longer moving into Dinder and Radom National Parks due to increasing disturbances and lack of management activities.

Surveys and data

No quantitative aerial survey work has been undertaken in Sudan since the early 1980s and any information available on the status of elephants is based on anecdotal observations from local people and aerial observations from pilots flying food and supplies into the area (East, 1997). One UN pilot noted a herd of 400 elephants in the Sudd swamps west of the Nile, as reported by Spinney (1996).

Hashim (pers. comm., 1998) designed a questionnaire and recorded information on elephant sightings but made little progress in his work due to lack of funds and general insecurity. His data are still too scarce to make an estimate of how many elephants remain in Sudan. SPLA soldiers have also been assisting in the protection of the Nimule National Park elephants, although the elephants' isolation in secluded pockets of range may ensure their protection more than any efforts by humans (Winter, 1997). Southern National Park in southwest Sudan may also contain significant elephant numbers (Dulling, 1992).

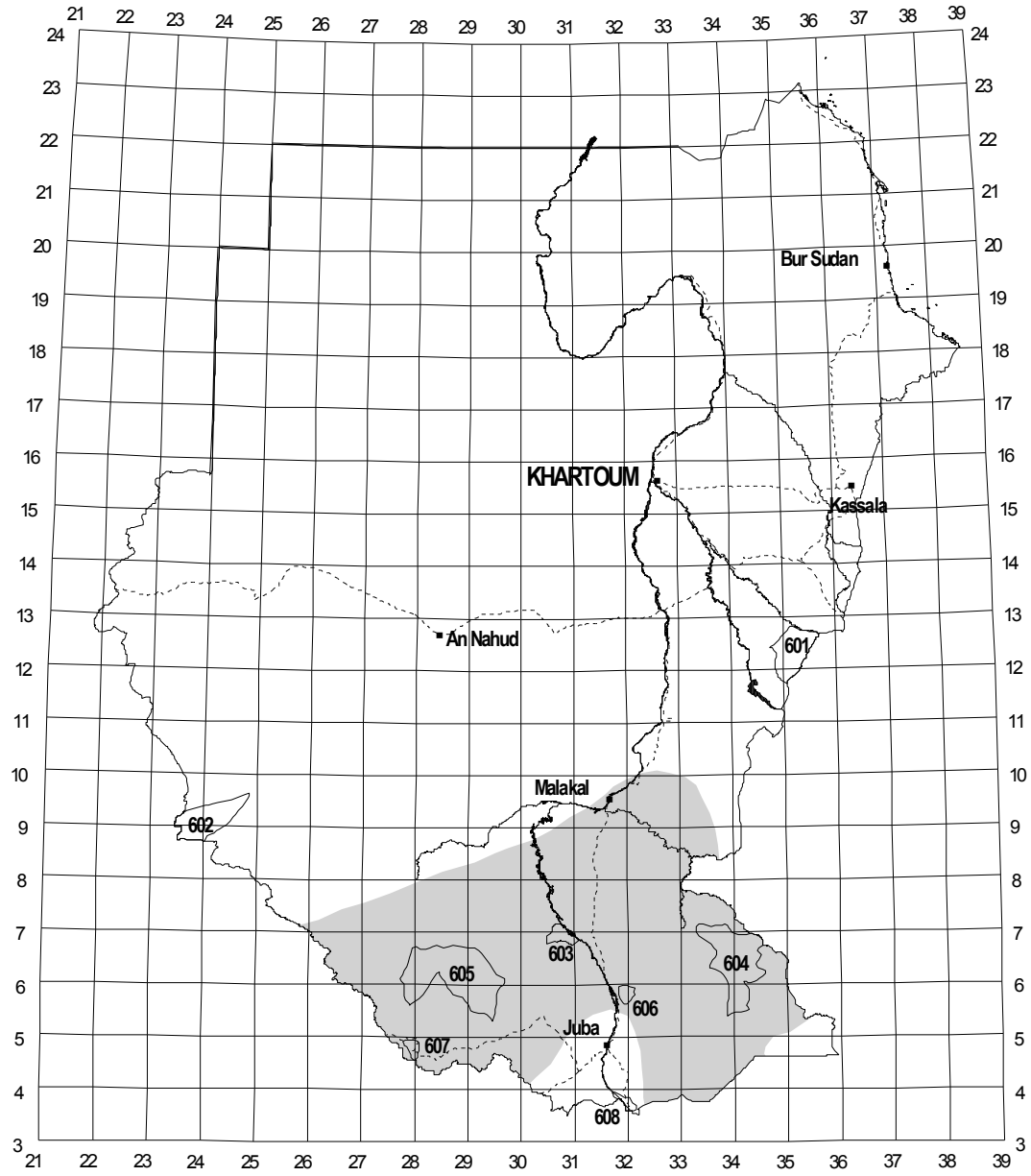
Cross-border movements

Elephants may still migrate between Sudan and Ethiopia around the Dinder and Gambella National Parks and Sudan to Kenya cross-border movements may also be possible, but no information is available. Elephants are thought to move into Sudan from Kidepo National Park in Uganda and from the Otze Forest in Uganda into the Nimule National Park in Sudan (Michelmore, pers. comm., 1998).

Issues

It is believed that elephant populations have suffered substantial losses since the early 1980s. On the other hand, the civil war may have reduced the hunting pressure put on elephant populations by rural people, because people have been concentrated into particular areas (Guillet, 1990). In April 1997 a peace agreement was signed between the Sudanese Government and the four fighting factions in the country. According to Ahmed (questionnaire reply, 1998), peace is now prevalent in the states of the Upper Nile, which all lie within the area of elephant range, ie. Jonglei, Western Bahar El Gazal, Northern Bahar El Gazal and Unity States Currently, however, there is little international financial assistance being provided for conservation efforts in the country and the political situation remains unstable. The Wildlife Act is now augmented by the Police Act, which should bring quicker prosecution and stronger penalties (Ahmed, questionnaire reply,1998). However, Martin (1998) notes that while ivory purchases in the country have declined since the 1980s, there are increasing numbers of Asian buyers entering the market, creating fresh demand for ivory. This is supported by information suggesting that ivory prices have doubled between 1996 and 1997. Martin (1998) also notes that the source of ivory for sale in Sudan is probably central Africa.

PROTECTED AREAS AND ELEPHANT RANGE IN SUDAN



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 16,000,000

KEY TO PROTECTED AREAS

National Park
601 Dinder
602 Radom
604 Boma
605 Southern
608 Nimule

Game Reserve
603 Shambe
606 Badingilo
607 Bengangai

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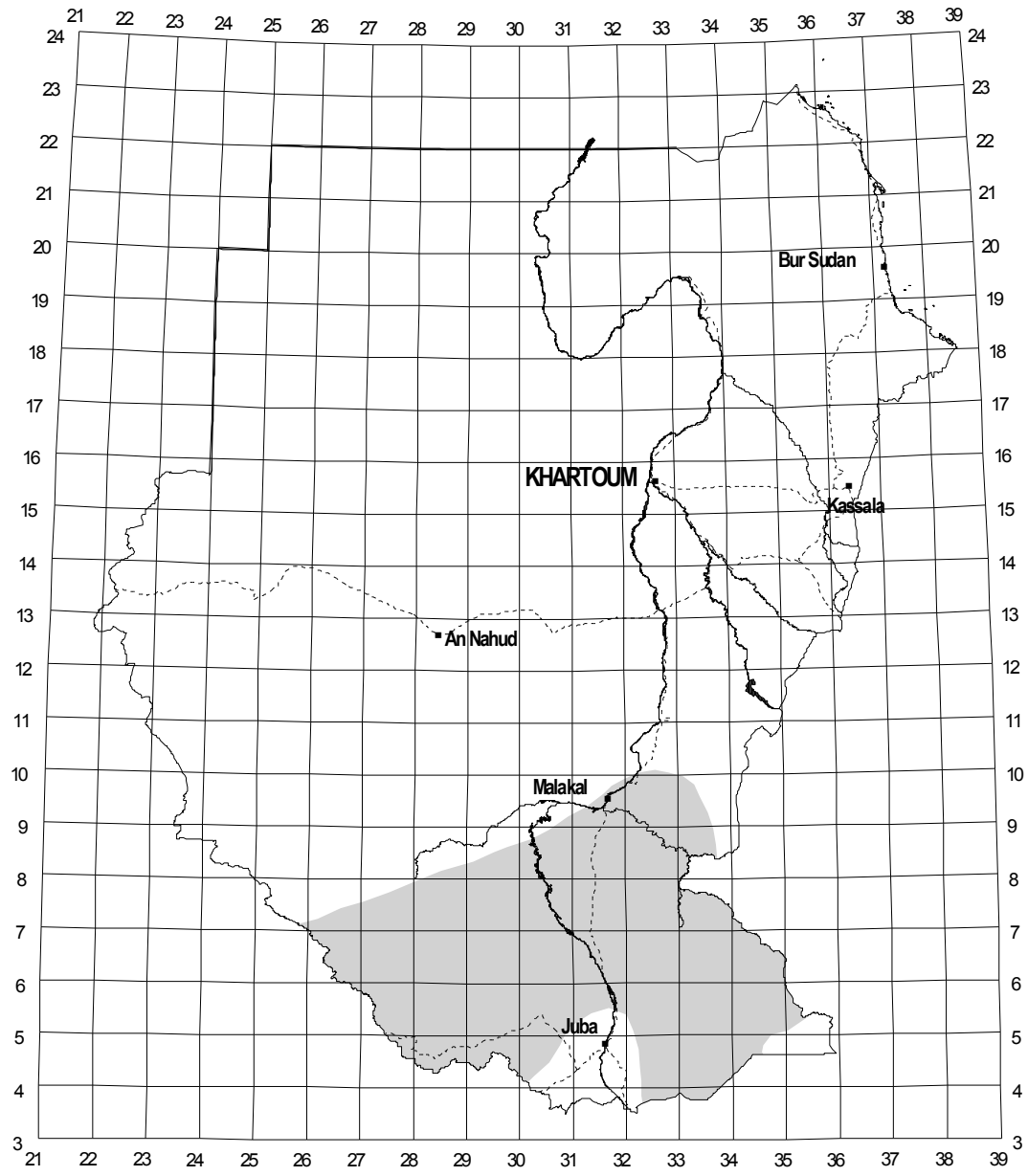
SURVEY ZONES AND ELEPHANT RANGE IN SUDAN



LEGEND

- Town
- Road
- River
- Lake
- 201 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 16,000,000

KEY TO POPULATION ESTIMATES

No recent censuses have been carried out in Sudan

N

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TANZANIA

General Statistics

Country area:	945,090km^2
Range area (% of country):	458,315km^2 (49%)
Protected area coverage (% of country):	14%
Protected range (% of range in protected areas):	28%

Range

Tanzania is fortunate to have an organisation - the Tanzania Wildlife Conservation Monitoring unit (TWCM) - dedicated to surveying wildlife on a regular basis. Since 1995, there have been several new surveys carried out covering a large portion of Tanzania's elephant range in protected areas. However, there are still substantial areas of range outside protected areas, especially in the west, for which there are no recent population estimates. For example, the area west of Ruaha/Rungwa was last censused in the late 1970s. These non-protected areas of range probably harbour considerable numbers of elephants in distinct populations.

Based on information supplied by Ndunguru (questionnaire reply, 1998), the range in southern Tanzania has been modified to include the area south of the Selous Game Reserve up to the border of Tanzania and Mozambique. A thin strip of elephant range has also been added along the same border. These changes are not due to the movement of elephants into new areas, but simply corrections to existing information.

A small area of range has also been added to the Mahunga area, south of the Burigi Game Reserve, based on the results of a rapid assessment of large mammal distribution in October 1996 (Western Tanzania Ecomonitoring Project, 1997). At the time of the survey the area was being considered by UNCHR as a potential site for 100,000 Rwandese refugees. The survey recorded elephant signs in 22 out of 37 line transects, suggesting that the area forms an important "elephant corridor" between the protected Burigi and Moyowosi Game Reserves.

Surveys and data

There are 21 survey zones listed in this update and all but two (Kilimanjaro and Rubondo Island National Parks) have been surveyed by TWCM since 1995. There are several more potential survey zones in Tanzania, especially in the west, which have not been surveyed. These include the forest reserves and the unprotected areas running west from Rungwa Game Reserve into Ugalla Game Reserve and north into the Kigosi and Moyowosi Game Reserves.

The estimates presented in the table have been supplied from TWCM reports, TWCM preliminary tables of estimates supplied to the AED manager, and personal communications. The Tarangire estimates, for inside and outside the park, are combined wet and dry season counts from aerial sample surveys conducted in March and September 1998 respectively (TWCM, 1998b; 1998c). Other 1998 estimates include the wet season survey of Moyowosi-Kigosi Game Reserves (TWCM, 1998a), and the Burigi and Serengeti estimates. The estimates for the Ruaha-Rungwa ecosystem originate from from the 1996 wet season count (TWCM, 1998d), but may be an underestimate because elephants tend to disperse beyond Ruaha in the rainy season.

A recent estimate which has not been included in the table is from a dung survey conducted by Poole and Reuling (1997) in the West Kilimanjaro basin because during the survey they identified more than 80 elephants from the Amboseli National Park (Kenya) population. The survey by the Western Tanzania Ecomonitoring Project (1997) did not provide an elephant estimate although elephant signs were frequent in the Mahunga area.

Cross-border movements

There are cross-border movements of elephants between Kenya and Tanzania in the Amboseli-Kilimanjaro ecosystem, as clearly illustrated by the Poole and Reuling (1997) study. There are also cross-border movements between Kenya and Tanzania in the Serengeti-Masai Mara and Mkomazi-Tsavo ecosystems. There also may be movements of elephants between Tanzania and Mozambique.

Issues

The government has approved a new national wildlife policy. The policy focuses on the need to manage wildlife according to ecological needs, and many migratory routes and wildlife corridors will be accorded a higher status of protection. The policy also focuses strongly on community participation in conservation. Also included is an explicit statement on the management of elephants as a symbolic species with large economic potential for the country (Maige, questionnaire reply, 1998).

Tanzania is the only East African nation which allows sport-hunting of elephants. Increasing concern has been expressed about how sport-hunting is being conducted and whether it is being done in a sustainable manner. The situation is particularly critical in the case of the Amboseli-Kilimanjaro elephant population, which is the focus of a long-term elephant study (20+ years), and from which elephants have been killed by sport-hunters when they moved to the Tanzania side of the border.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Tanzania

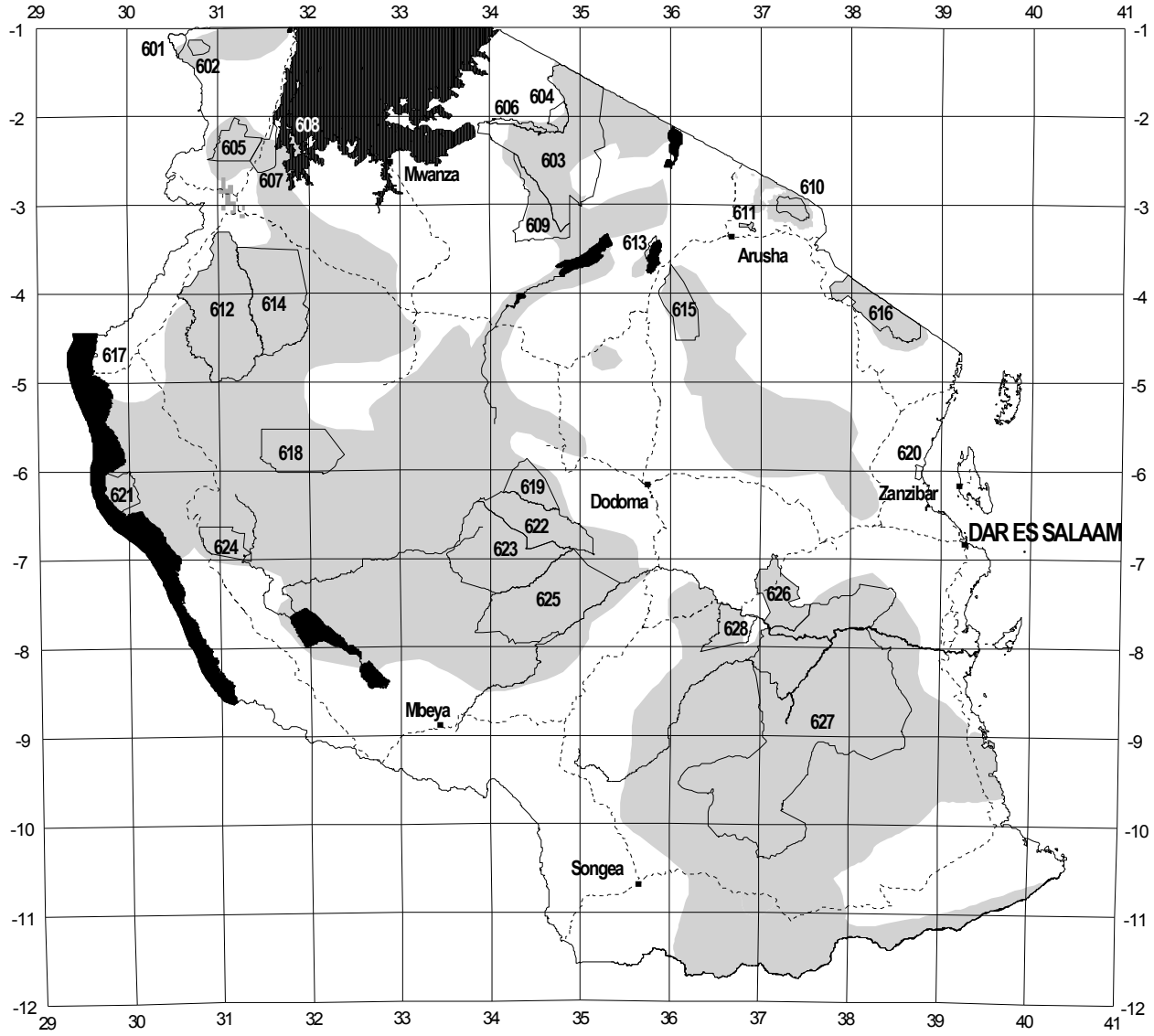
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Burigi Game Reserve	1998	938	1,632	1,752	1.74	TWCM, 1998d	AS2	B
201	Outside Burigi	1998	1,471	77	141	0.05	TWCM, 1998d	AS2	B
102	Rubondo Island National Park	1990	400	14		0.04	TWCM, 1992	IG3	D
103	Kilimanjaro National Park	1990	418	220	88	0.53	TWCM, 1992	DC2	C
104	Moyowosi-Kigosi Game Reserve	1998	21,870	2,262	1,403	0.10	TWCM, 1998a	AS2	B
105	Tarangire National Park	1998	2,619	1,398		0.53	TWCM, 1998b; TWCM, 1998c	AT3	A
202	Outside Tarangire	1998	10,207	416		0.04	TWCM, 1998b; TWCM, 1998c	AT3	A
106	Mkomazi Game Reserve	1996	3,509	346	465	0.10	TWCM, 1998d	AS3	B
109	Katavi National Park	1995	1,905	1,493	341	0.78	TWCM, 1998d	AS2	B
204	Outside Katavi	1995	11,436	3,505	2,335	0.31	TWCM, 1998d	AS2	B
301	Serengeti	1998	16,860	2,015		0.12	TWCM, 1998d	AT3	A
302	Maswa and Ngorongoro	1992	4,275	315		0.07	Farm, pers. comm., 1995	AT3	A
303	Ugalla River	1996	6,524	761	655	0.12	TWCM, quest. reply, 1998	AS2	B
401	**Ruaha-Rungwa Ecosystem**	**1996**	**41,297**	**13,021**	**4,300**	**0.32**	**TWCM, quest. reply, 1998**	**AS3**	**B**
110	Ruaha National Park	1996	10,366	3,120	2,342	0.30	TWCM, 1998d	AS3	B
107	Muhesi Game Reserve	1996	4,539	2,558	2,549	0.56	TWCM, 1998d	AS3	B
108	Rungwa-Kizigo Game Reserve	1996	14,189	6,090	1,960	0.43	TWCM, 1998d	AS3	B

203	Remainder of Ruaha-Rungwa	1996	14,297	1,253	1,631	0.01	TWCM, 1998d	AS3	B
402	**Selous Ecosystem**	**1994**	**91,981**	**52,151**	**10,661**	**0.57**	**TWCM, 1995**	**AS2**	**B**
111	Mikumi National Park	1994	3,215	700	309	0.22	TWCM, 1995	AS2	B
112	Selous Game Reserve	1994	43,626	31,735	9,183	0.73	TWCM, 1995	AS2	B
206	Kilombero	1994	6,928	1,903	514	0.27	TWCM, 1995	AS2	B
205	Remainder of Selous	1994	38,212	17,836	6,101	0.47	TWCM, 1995	AS2	B

SUMMARY OF TOTALS FOR TANZANIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	4,144	0	0	0
B	Aerial or Ground Sample Counts	63,272	11,976	11,976	0
C	Dung Counts	0	220	88	0
D	Informed Guesses	0	0	14	0
E	Other Guesses	0	0	0	0
	TOTAL	**67,416**	**12,196**	**12,078**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN TANZANIA



LEGEND

- Town
- Road
- River
- Lake
- 603 Protected Area
- Elephant Range

Scale 1 : 9,000,000

KEY TO PROTECTED AREAS

National Park
603 Serengeti
608 Rubondo Island
610 Kilimanjaro
611 Arusha
613 Lake Manyara
615 Tarangire
617 Gombe
621 Mahale Mountains
624 Katavi
625 Ruaha
626 Mikumi
628 Udzungwa Mountains

Game Reserve
601 Ibanda
602 Rumanyika
604 Ikorongo
605 Burigi
606 Grumeti
607 Biharamulo
609 Maswa
612 Moyowosi
614 Kigosi
616 Mkomazi
618 Ugalla River

619 Muhesi
620 Saadani
622 Kizigo
623 Rungwa
627 Selous

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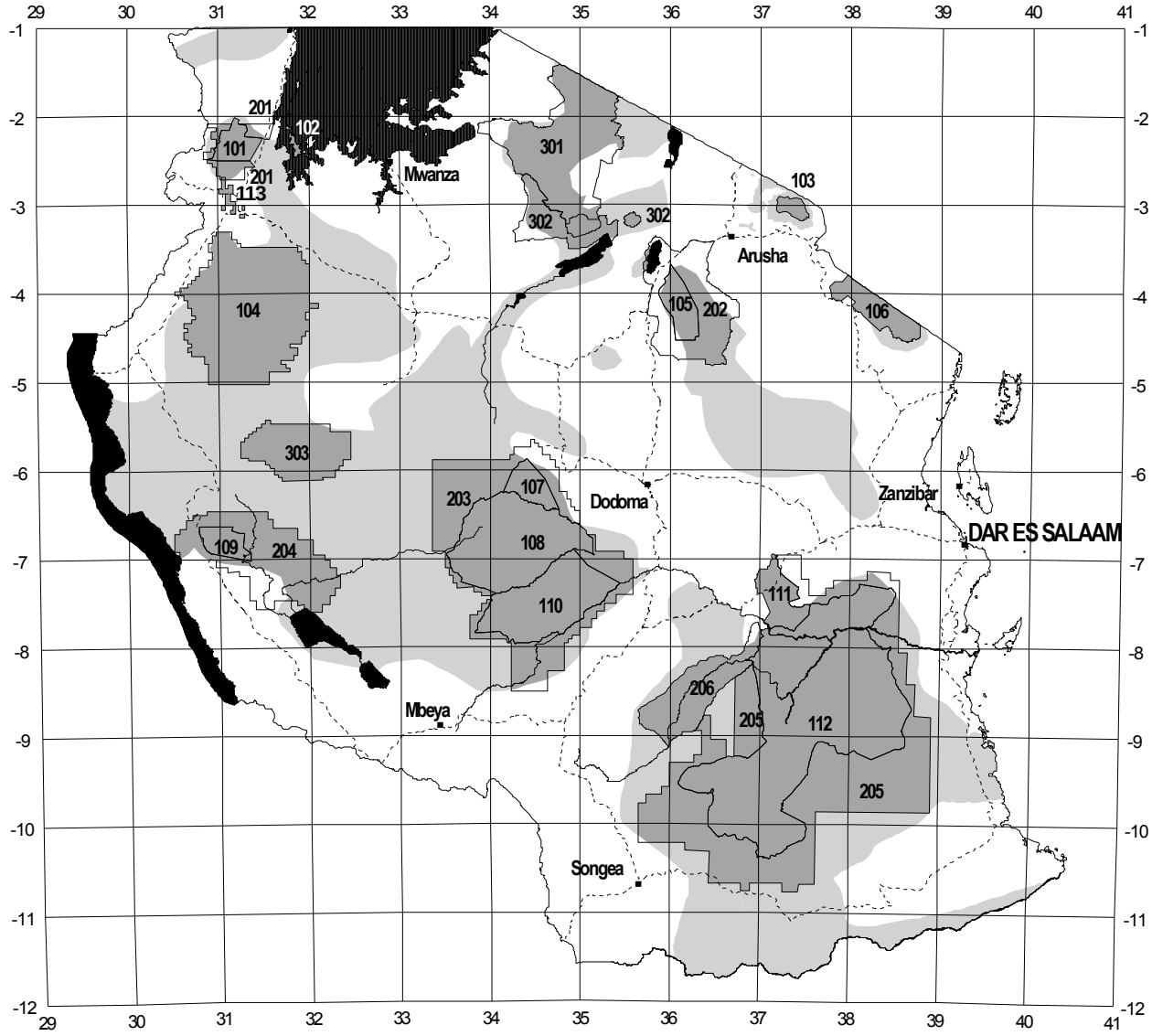
SURVEY ZONES AND ELEPHANT RANGE IN TANZANIA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 9,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Burigi Game Reserve	1632
102	Rubondo Island National Park	14
103	Kilimanjaro National Park	220
104	Moyowosi-Kigosi Game Reserve	2262
105	Tarangire National Park	1398
106	Mkomazi Game Reserve	346
107	Muhesi Game Reserve	2558
108	Rungwa-Kizigo Game Reserve	6090
109	Katavi National Park	1493
110	Ruaha National Park	3120
111	Mikumi National Park	700

CODE	ZONE NAME	ESTIMATE
112	Selous Game Reserve	31735
201	Outside Burigi	77
202	Outside Tarangire	416
203	Remainder of Ruaha-Rungwa	1253
204	Outside Katavi	3505
205	Remainder of Selous	17836
206	Kilombero	1903
301	Serengeti	2015
302	Maswa and Ngorongoro	315
303	Ugalla River	761
113	Biharamulo &Nyakanazi Forest Reserve	126

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UGANDA

General Statistics

Country area:	236,040km^2
Range area (% of country):	11,872km^2 (5%)
Protected area coverage (% of country):	8%
Protected range (% of range in protected areas):	87%

Range

A country-wide survey was commissioned by the Ministry of Tourism, Wildlife and Antiquities (MTWA) and carried out in 1995 and 1996 for all protected areas and wildlife-rich public land (MTWA, 1996a,b). Following the actual aerial surveys, the European Union Wildlife Support Programme, in collaboration with the Ministry of Tourism, Trade and Industry, reviewed the status of protected areas in more detail. Information was gathered from ground assessments, additional aerial surveys, and interviews with game rangers and forest officers, to produce a comprehensive review of the wildlife protected areas. Based on the all the information gathered, a number of range changes were made to the map (Michelmore, pers. comm., 1998). New additions include Otze Forest, based on anecdotal information that elephants move there from Nimule National Park in Sudan, the Rabongo Forest area north of Murchison Falls National Park and the Toro/Semliki area north of Semliki National Park. The latter two additions are based on sightings of elephants from a Murchison Falls National Park 'plane and by Michelmore (pers. comm., 1998) respectively.

Based on the same review of information, summarised on the map supplied by Michelmore (pers. comm., 1998), the area of range has been reduced for Bwindi Impenetrable Forest National Park and Kidepo Valley National Park and deleted for Mgahinga Gorilla National Park, Katonga Game Reserve, Ruwenzori Mountains National Park and Mount Elgon National Park – the latter appears to have no elephants even though the population on the Kenyan side numbers over 1,000 (Mulama *et al.*, 1996).

Surveys and data

Aerial survey work was carried out in many savanna areas of Uganda, providing new estimates for Murchison Falls National Park, Karuma Wildlife Reserve, Kyambura Wildlife Reserve and Kigezi Wildlife Reserve (MTWA, 1996a). The MTWA (1996a) also surveyed Kidepo Valley National Park but Olivier's (1992) estimate has been retained instead because his was an aerial total count. The older estimate for Kibale National Park (Edroma, 1994), based on park staff reports, has also been retained. The Queen Elizabeth National Park has the largest elephant population in Uganda, estimated by Michelmore (pers. comm., 1998) at 800 elephants, who based her informed guess on the results of a 1995 aerial sample survey by Lamprey and Michelmore (MTWA, 1996a) and the observations of park staff on elephant movements to and from DRC. Other protected areas could not be surveyed in 1995, mainly due to insecurity, and the estimates from these areas are classified as guesses. Those of Toro/Semliki and Luwero are classified as informed guesses because in the former, elephants have been seen and in Luwero there are many incidents of crop-raiding by elephants (Michelmore, pers. comm., 1998). Estimates for Semliki, Bwindi, Otze and Sango Bay are not supported with clear information and are classified as other guesses.

Sommerlatte and Williamson (1995) also carried out two aerial surveys of Murchison Falls National Park in April and December of 1995. The first survey was an 11% sample while the second was a 6.5% sample. These estimates were not used because they are older than the MTWA survey. They did, however, estimate a total of 201 ±93 elephants for the area in the April survey and 336 ±153 in the December 1995 survey (Sommerlatte and Williams (1995). It is interesting to note that all the elephants seen during these three surveys were counted in the northern portion of the park. All the groups except one were seen north of the Victoria Nile, with the one exception sighted on the southern edge of the river (MTWA, 1996a).

Cross-border movements

Cross-border elephant movements possibly occur between Uganda, DRC, Kenya and Sudan. Elephants move between DRC and Queen Elizabeth National Park in Uganda (Hart, pers. comm., 1998; Michelmore, pers. comm., 1998), and they may also move from Kidepo National Park into Sudan (Michelmore, pers. comm., 1998). The Toro/Semliki population has been seen from the air moving into DRC in groups (Michelmore, pers. comm., 1998).

Issues

Uganda is beginning to develop a thriving tourist industry revolving around wildlife, as its wildlife numbers begin to recover from the massive poaching levels in the 1970s and 1980s. In the hopes of streamlining and optimising government performance in the sector, Uganda, in 1996, moved to combine the Game Department and Uganda National Parks into a single wildlife management authority called the Uganda Wildlife Authority.

Although elephant numbers are far below the 1960s levels, incidents of crop-raiding are increasing. One problem area is only about 50km from the capital city, Kampala (Cites Management Authority [Uganda], 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

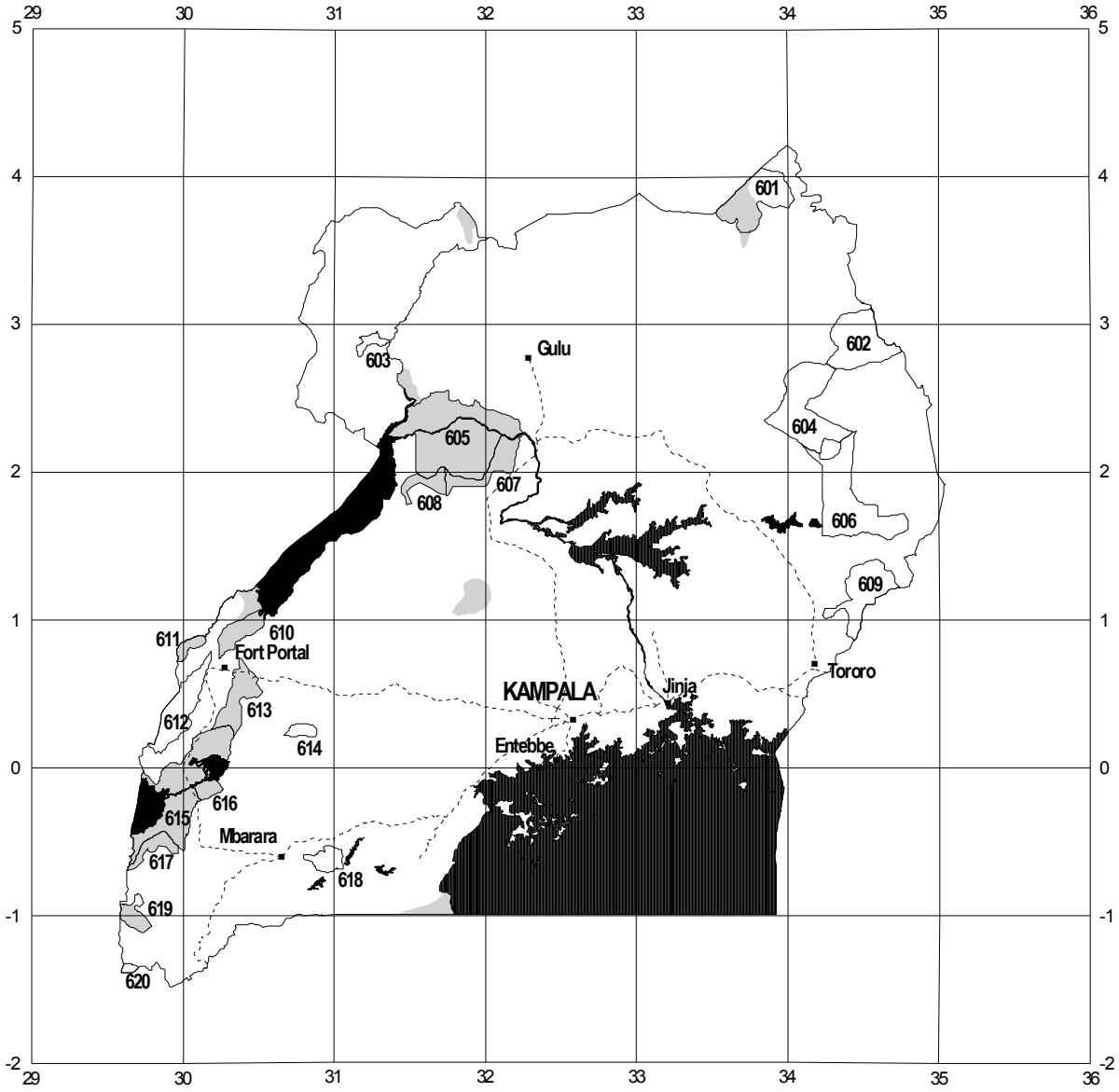
Uganda

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Kidepo Valley National Park	1992	1,416	215		0.15	Olivier, 1992	AT2	A
102	Murchison Falls National Park	1995	3,795	336	300	0.09	MTWA, 1996a	AS2	B
103	Karuma Wildlife Reserve	1995	696	0		0.00	MTWA, 1996a	AS2	B
104	Bugungu Wildlife Reserve	1995	553	0		0.00	MTWA, 1996a	AS2	B
105	Semliki National Park	1998	195	30		0.15	Michelmore, pers. comm., 1998	OG3	E
106	Kibale National Park	1994	946	150		0.16	Edroma, 1994	IG3	D
107	Queen Elizabeth National Park	1998	2,343	800		0.34	Michelmore, pers. comm., 1998	IG3	D
108	Kyambura Wildlife Reserve	1995	213	0		0.00	MTWA, 1996a	AS2	B
109	Kigezi Wildlife Reserve	1995	850	229	545	0.27	MTWA, 1996a	AS2	B
110	Bwindi Impenetrable Forest National Park	1998	336	20		0.06	Michelmore, pers. comm., 1998	OG3	E
201	Otze Forest	1998	200	200		1.00	Michelmore, pers. comm., 1998	OG3	E
202	Luwero	1998	510	10		0.02	Michelmore, pers. comm., 1998	IG3	D
203	Sango Bay	1998	305	30		0.10	Michelmore, pers. comm., 1998	OG3	E
301	Toro/Semliki	1998	790	80		0.10	Michelmore, pers. comm., 1998	IG3	D

SUMMARY OF TOTALS FOR UGANDA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	215	0	0	0
B	Aerial or Ground Sample Counts	0	565	622	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	1,040	0
E	Other Guesses	0	0	0	280
TOTAL		**215**	**565**	**1,622**	**280**

PROTECTED AREAS AND ELEPHANT RANGE IN UGANDA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 5,500,000

KEY TO PROTECTED AREAS

National Park
601 Kidepo Valley
605 Murchison Falls
609 Mount Elgon
611 Semliki
612 Rwenzori Mountains
613 Kibale
615 Queen Elizabeth
618 Lake Mburo
619 Bwindi Impenetrable Forest
620 Mgahinga Gorilla

Wildlife Reserve
602 Matheniko
603 Ajai
604 Bokora Corridor
606 Pian Upe
607 Karuma
608 Bugungu
610 Toro/Semliki Valley
614 Katonga
616 Kyambura
617 Kigezi

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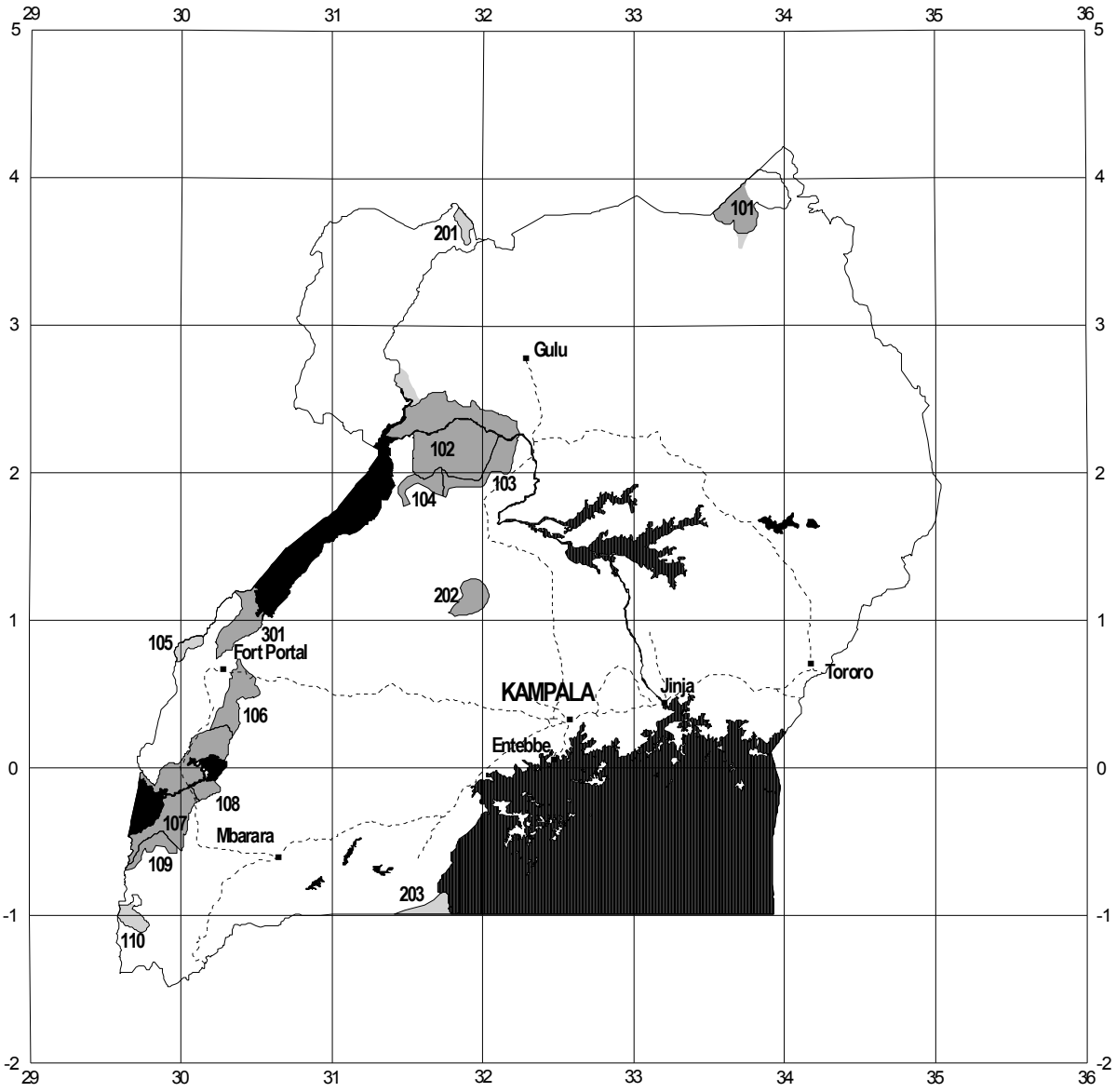
SURVEY ZONES AND ELEPHANT RANGE IN UGANDA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 5,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Kidepo Valley NP	215
102	Murchison Falls NP	336
103	Karuma WR	0
104	Bugungu WR	0
105	Semliki NP	30
106	Kibale NP	150
107	Queen Elizabeth NP	861
108	Kyambura WR	0
109	Kigezi WR	229
110	Bwindi Impenetrable NP	20

CODE	ZONE NAME	ESTIMATE
201	Otze Forest	200
202	Luwero	10
203	Sango Bay	30
301	Toro/Semliki	80

KEY TO ZONE NAMES
NP - National Park
WR - Wildlife Reserve

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SOUTHERN AFRICA

SOUTHERN AFRICA

Southern Africa supports the largest number of elephants among the four regions of Africa and about 30% of the remaining elephant range (Figure 2). Nine countries, Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe, harbour elephant populations in mostly savanna habitat. Because of this, elephants are counted mainly from aerial surveys and ground counts, which in turn have produced the largest **Definite** estimate for any region (Figure 8). The region features large, unbroken areas of elephant range and contains a significant number of cross-border populations.

Southern Africa has seen peace and stability return to most countries, with only Angola appearing to return to civil war. Therefore, new population figures and elephant ranges have been estimated for all countries except Angola, where no new studies have taken place.

In this edition of the AED, Southern Africa has a total of 106 survey zones, 91 of which have had population estimates between 1995 and 1998. Seventy-one of the 106 survey zones have been surveyed by aerial surveys, ground counts or dung counts, while the elephant populations in the remaining zones have been estimated from guesses. Many of the survey zones have produced recent population estimates.

There have not been any reports of large-scale poaching incidents in the region over the past three years.

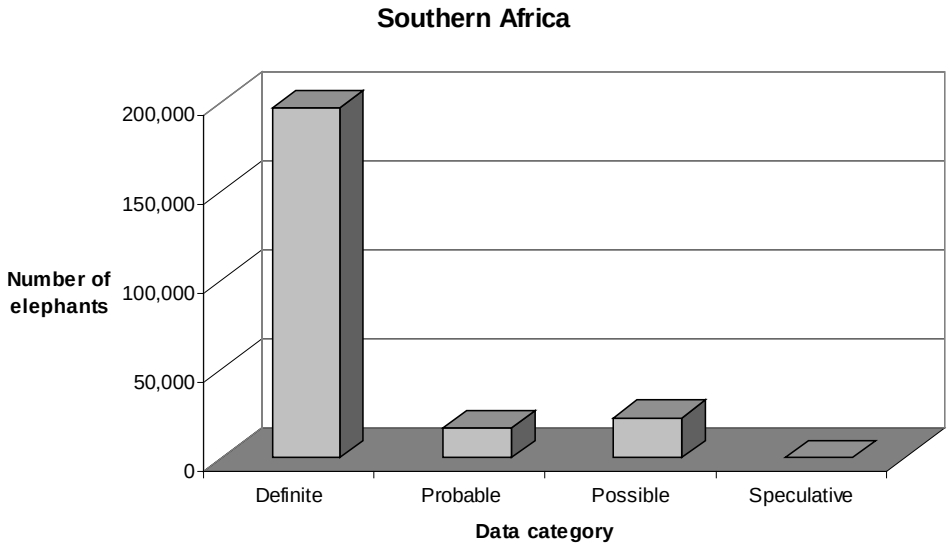
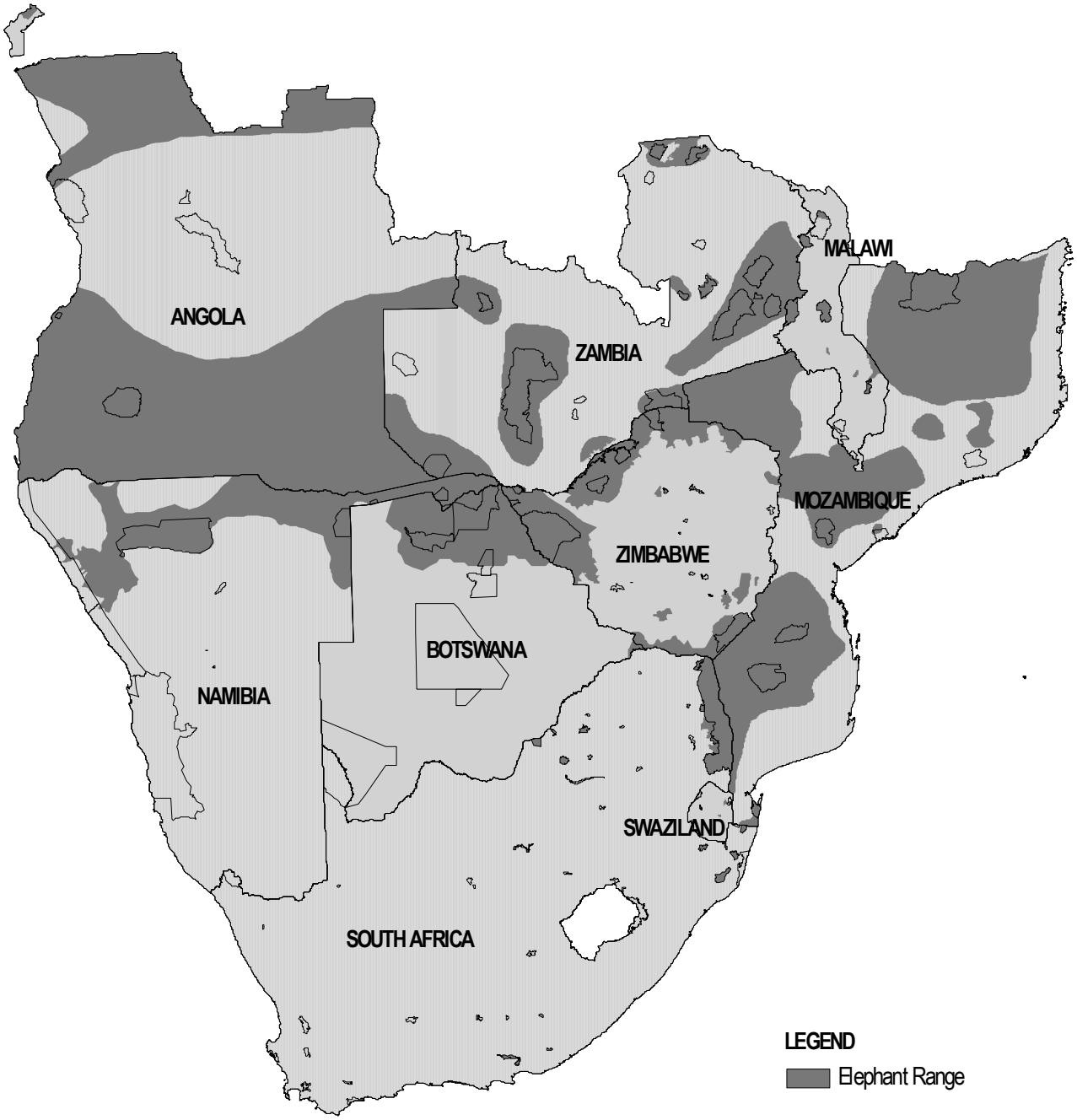


Figure 8. Elephant estimates by category for Southern Africa.

SUMMARY OF ELEPHANT ESTIMATES IN SOUTHERN AFRICA

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
SOUTHERN AFRICA	Angola	0	0	0	170	1,246,700	678,785
	Botswana	76,644	13,414	13,414	0	600,370	81,486
	Malawi	647	1,569	1,649	20	118,480	7,968
	Mozambique	6,898	1,946	4,496	0	801,590	467,062
	Namibia	6,263	1,421	1,421	0	825,418	145,015
	South Africa	11,905	0	0	0	1,219,912	25,847
	Swaziland	39	0	0	0	17,360	188
	Zambia	15,873	6,179	6,964	0	752,610	208,123
	Zimbabwe	63,070	8,034	10,185	0	390,580	109,563
TOTAL		**196,845**	**17,057**	**22,623**	**190**	**5,973,020**	**1,724,037**

PROTECTED AREAS AND ELEPHANT RANGE IN SOUTHERN AFRICA



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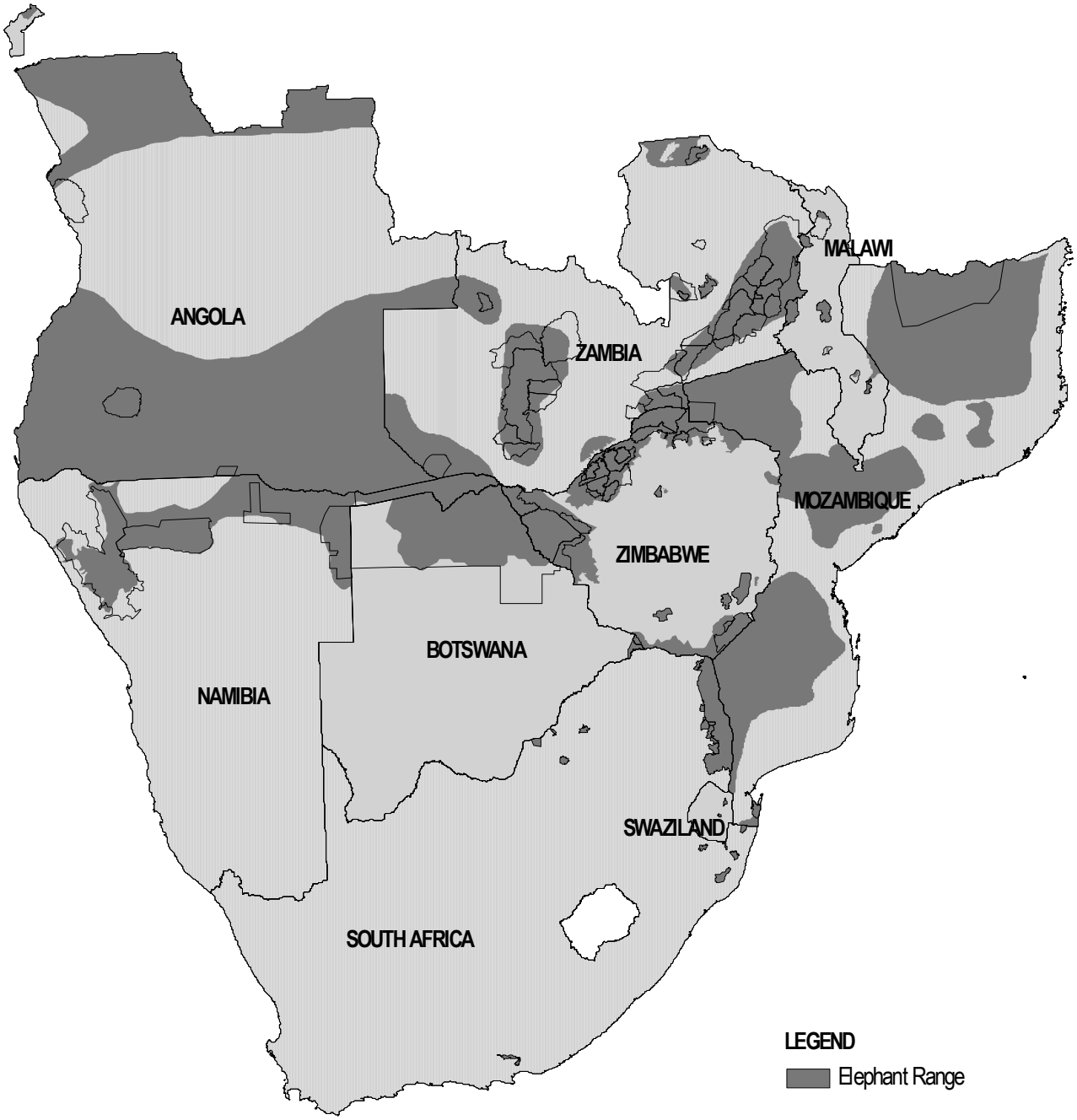
SURVEY ZONES AND ELEPHANT RANGE IN SOUTHERN AFRICA



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ANGOLA

General Statistics

Country area:	1,246,700km^2
Range area (% of country):	678,785km^2 (54%)
Protected area coverage (% of country):	2%
Protected range (% of range in protected areas):	1%

Range

No changes have been made to the map of elephant range since the last update. The range estimates remain highly speculative, as no new survey work has been carried out.

Surveys and data

Relatively little is known about the wildlife situation in Angola in general and there have been no new elephant estimates since the aerial surveys carried out by Hall-Martin and Pienaar (1992) in the southeast and the qualitative surveys of Anstey (1993), which were conducted in 1992. All formal survey work in Angola was suspended from 1991 (Enock, pers. comm., 1998). Survey work was to begin again in 1992 or 1993 but escalation of civil war prevented it.

The estimate for Bikuar National Park has been reduced from 100 to 50 based on a report by Anstey (1993). All other estimates remain the same, as no new data are available to justify any changes.

Cross-border movements

There may be cross-border movements of elephants between Angola and Namibia, Zambia, Zimbabwe, Botswana and possibly DRC, but no information is available.

Issues

Surveys are needed urgently to ascertain current elephant population levels and distribution but unfortunately the political situation in the country remains unstable. Angola did not participate in the ELESMAP project and therefore the importance of the Angolan elephant population in relation to other countries in southern Africa is unknown.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

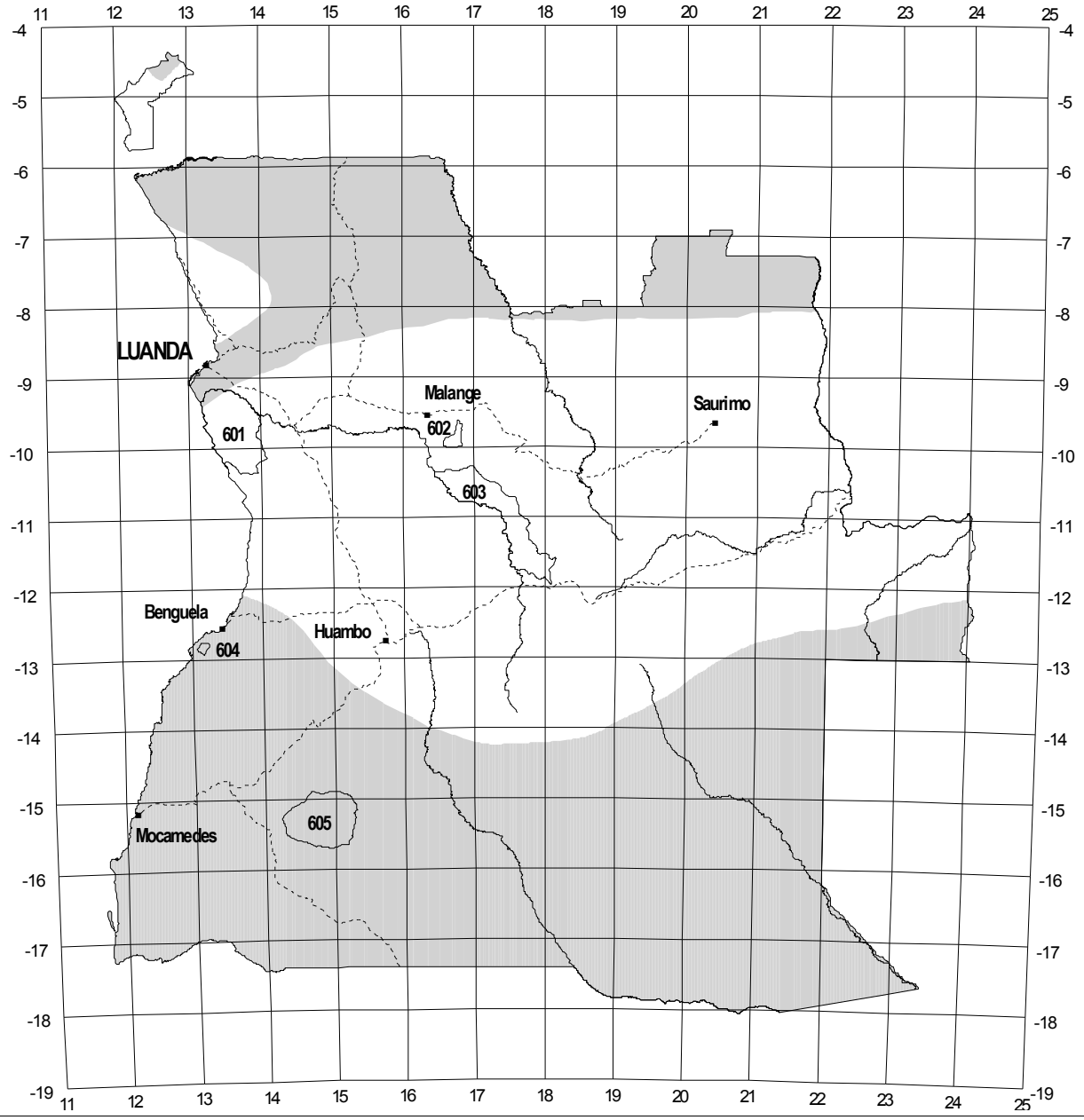
Angola

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Kisama National Park	1992	9,500	50		0.00	Anstey, 1993	IG3	E
102	Bikuar National Park	1992	7,900	60		0.00	Anstey, 1993	IG3	E
201	Bongola	1992	1,505	60		0.04	Anstey, 1993	IG3	E

SUMMARY OF TOTALS FOR ANGOLA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	170
TOTAL		**0**	**0**	**0**	**170**

PROTECTED AREAS AND ELEPHANT RANGE IN ANGOLA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 11,000,000

KEY TO PROTECTED AREAS

National Park
601 Kisama
602 Kangandala
605 Bikuar

Integral Nature Reserve
603 Luando

Regional Nature Park
604 Chimalavera

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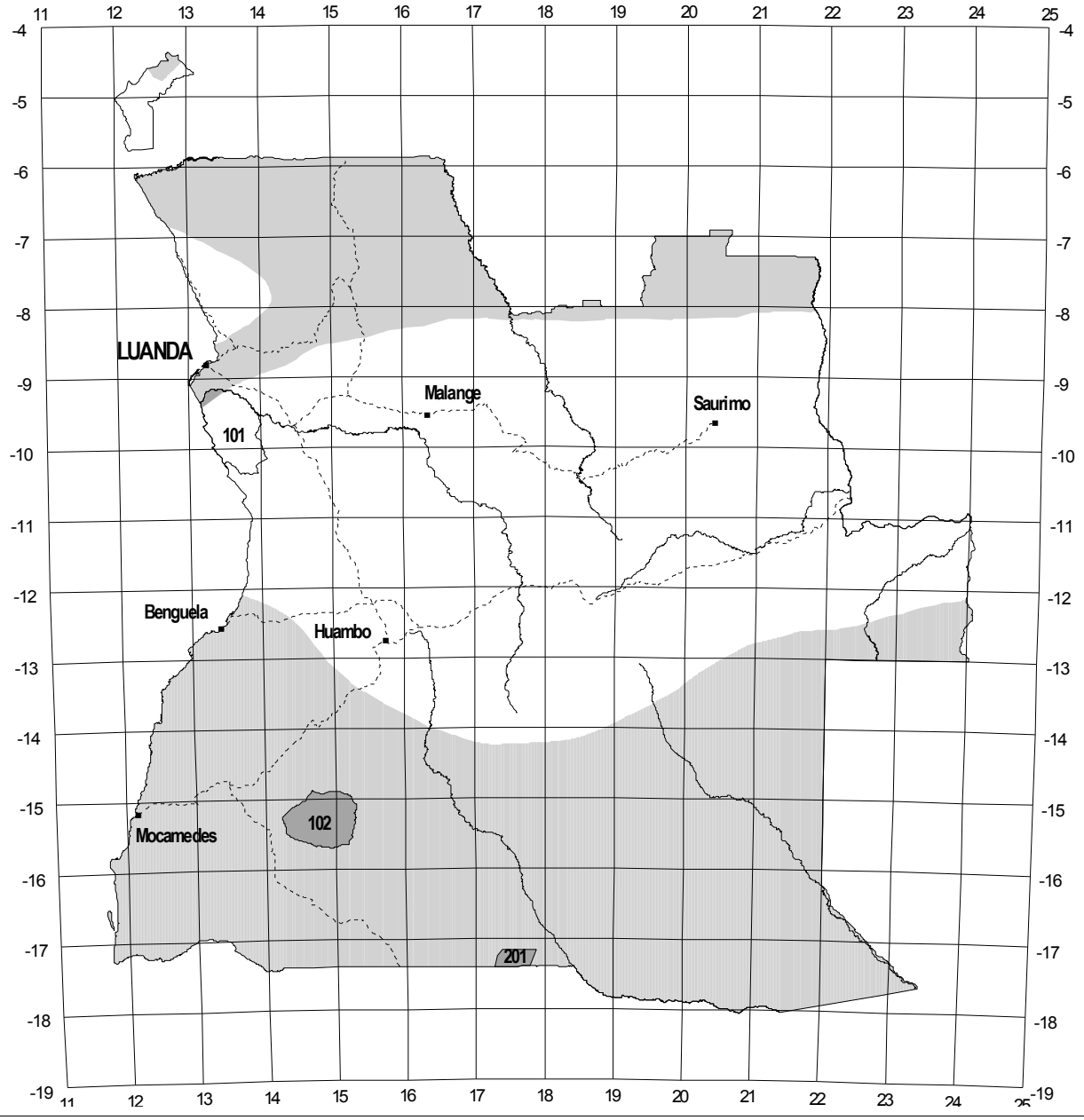
SURVEY ZONES AND ELEPHANT RANGE IN ANGOLA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 11,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Kisama National Park	50
102	Bikuar National Park	60
201	Bongola	60

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BOTSWANA

General Statistics

Country area:	600,370km^2
Range area (% of country):	81,486km^2 (14%)
Protected area coverage (% of country):	17%
Protected range (% of range in protected areas):	12%

Range

There are two distinct areas of elephant range in Botswana. The first, located in the north, comprises the vast majority of the country's range. It encompasses savanna woodlands, open grasslands, and the floodplains and swamps of the Okavango Delta. Occasionally, elephants move south out of the northern Botswana range. In 1997 two elephants moved south through the Kalahari, into Gemsbok National Park and then into South Africa (Thouless, pers. comm., 1998).

The second range area, that of the Tuli Game Reserve, is considerably smaller and lies in the eastern corner of Botswana covering 927km^2 at the Shashe/Limpopo confluence (ULG Consultants Ltd., 1994a, 1994b).

Surveys and data

Wildlife surveys are undertaken regularly in Botswana using aerial sample counts of the whole northern elephant range, including Chobe National Park, Moremi Game Reserve and the rest of northern Botswana, as well as the eastern range of Tuli Game Reserve.

There have been three surveys of northern Botswana since 1995. Following discussion on how best to use the accumulated data for this update, the recommendation from the Department of Wildlife and National Parks (DWNP) was used i.e. to merge the 1995 and 1996 dry season survey estimates (DWNP, 1995, 1996) thereby lowering confidence limits and reducing the large variation in estimates which resulted from a low sampling intensity.

Cross-border movements

Botswana's main elephant population, with more elephants than any other population on the continent, is found in the north where elephant range extends into Zimbabwe, Namibia (Craig, 1996) and possibly into Zambia and Angola as well. Elephants also move from the Tuli Game Reserve in Botswana to Zimbabwe and South Africa.

Issues

There is increasing pressure on elephant populations in Botswana from expanding human settlements, increased land needs for cattle ranching and massive fencing operations by the Botswana Department of Veterinary Sciences to manage foot and mouth disease. In many cases, seasonal access to dry season watering areas has been limited and wildlife habitats outside protected areas, which normally act as dispersal zones, are being degraded (East, 1998). It is hoped that the connection of existing parks, e.g. Moremi National Park and Chobe National Park, Nxai Pan and Makgadikgadi National Parks, has ensured the long-term security of elephants by creating corridors for elephant migrations from one area to another (Masogo, questionnaire reply, 1998).

New legislation allowed for the re-opening of elephant sport-hunting in the 1997 hunting season, with an initial quota of 80 elephants. However, according to Masogo (questionnaire reply, 1998), this quota is unlikely to impact significantly on the elephant population size. In addition to new legislation regarding sport-hunting, an elephant management policy is being reviewed for the country.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Botswana

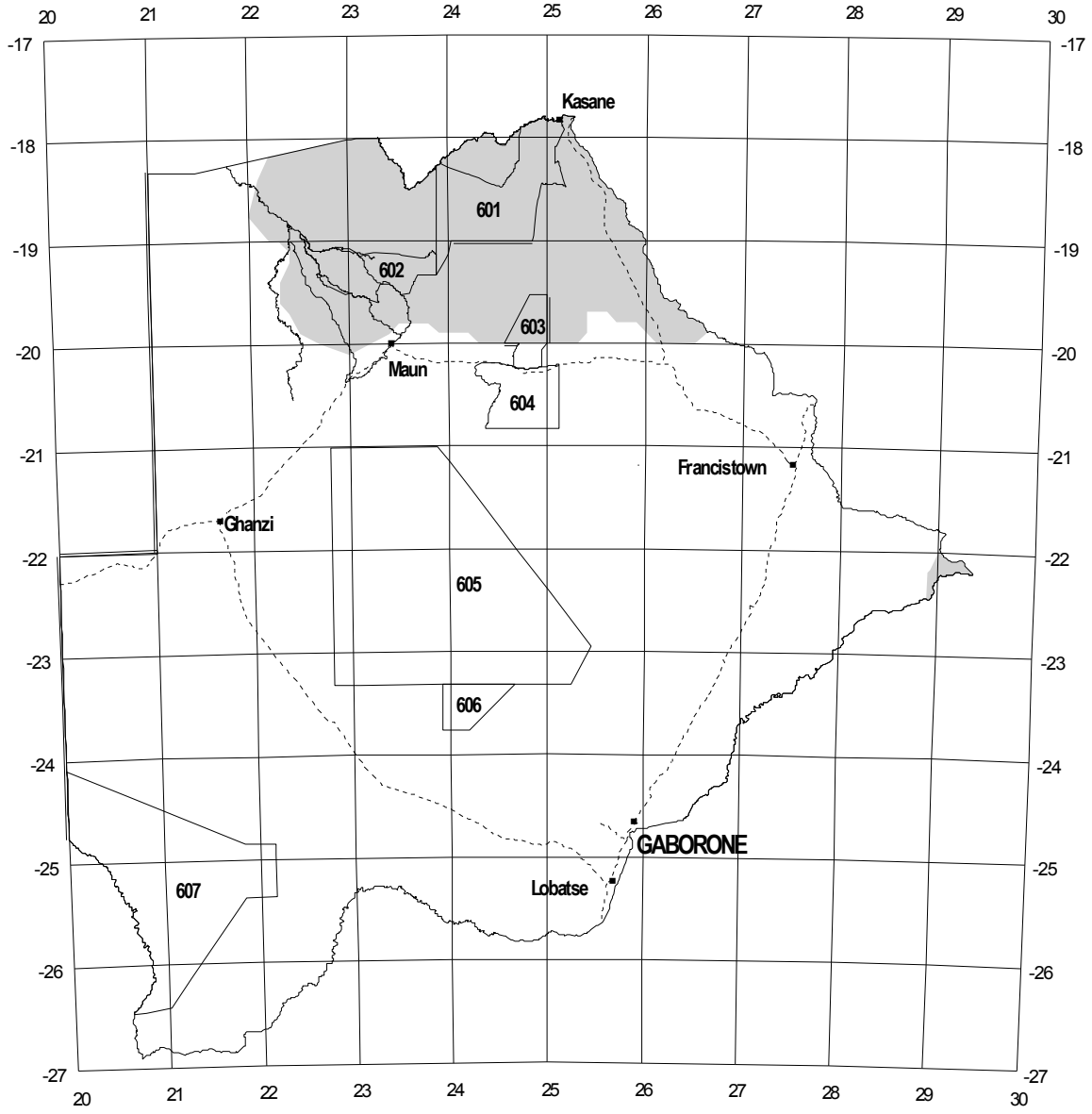
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Chobe National Park	1996	10,570	25,532	10,045	2.42	DWNP, 1996	AS3	B
102	Moremi Game Reserve	1996	4,968	7,758	4,729	1.56	DWNP, 1996	AS3	B
201	Tuli Block	1994	885	831	456	0.94	ULG, 1994a,b	AS1	B
301	Northern Botswana	1995, 1996**	122,922	89,227	13,406	0.73	DWNP, 1995,1996	AS3	B

*Part of Northern Botswana population
** Merged results of the 1995 and 1996 surveys

SUMMARY OF TOTALS FOR BOTSWANA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	76,644	13,414	13,414	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	0
TOTAL		**76,644**	**13,414**	**13,414**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN BOTSWANA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 8,000,000

KEY TO PROTECTED AREAS

National Park
601 Chobe
603 Nxai Pan
604 Makgadikgadi
607 Gemsbok

Game Reserve
602 Moremi
605 Central Kalahari
606 Khutse

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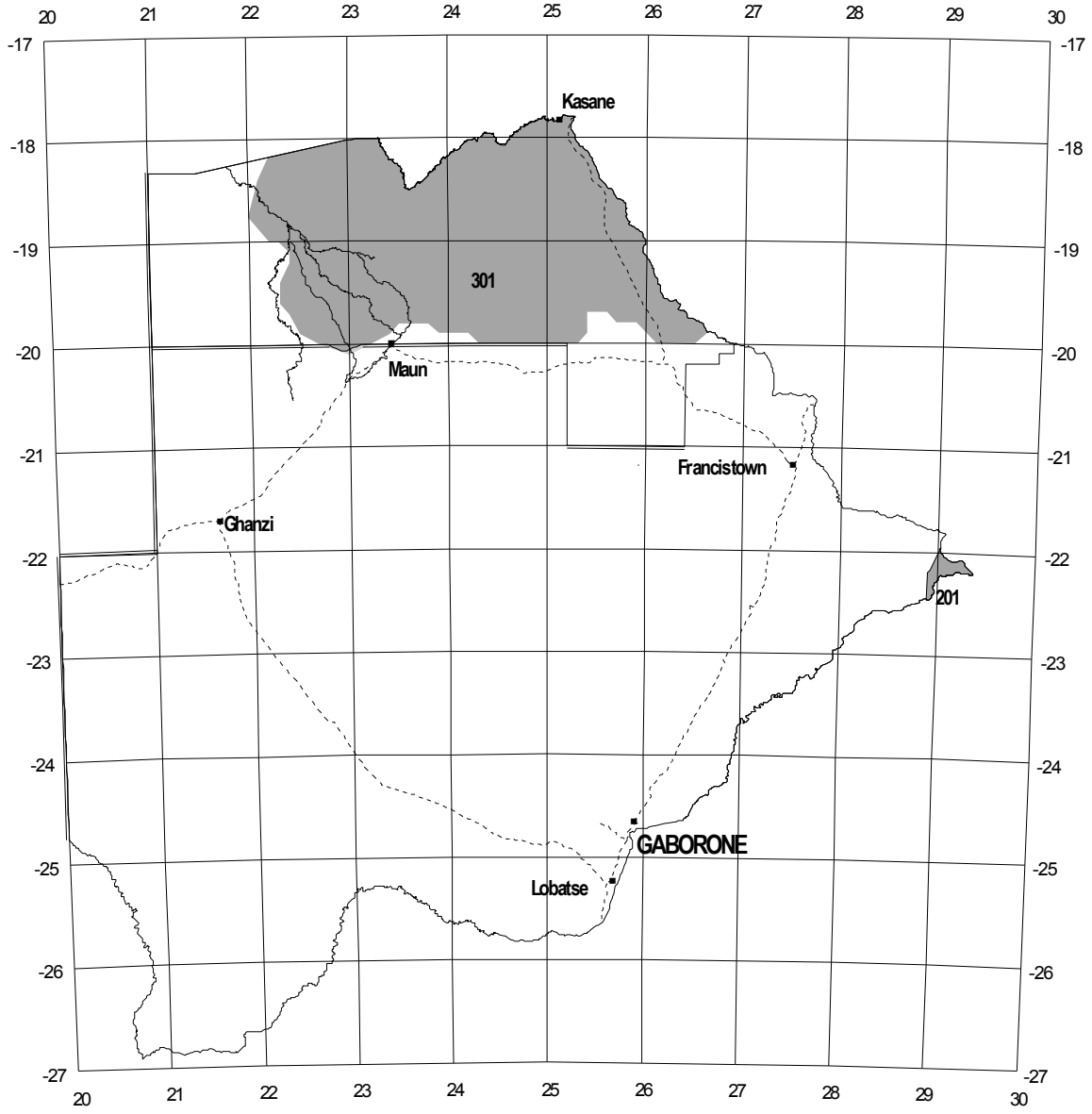
SURVEY ZONES AND ELEPHANT RANGE IN BOTSWANA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 8,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Tuli Game Reserve	831
301	Northern Botswana	89227

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UNEP

MALAWI

General Statistics

Country area:	118,480km^2
Range area (% of country):	7,968km^2 (7%)
Protected area coverage (% of country):	9%
Protected range (% of range inprotected areas):	78%

Range

Because of the size of the country and the relatively high human population densities, Malawi's elephants are almost entirely confined to protected areas, including national parks and forest reserves, with only a small part of the range found outside protected areas in the southeast (Bhima, 1996). The depiction of range is considered to be reliable, due to the extent of survey work done. The major elephant populations reside in Kasungu and Liwonde National Parks, and the Nkhotakota and Vwaza Marsh Wildlife Reserves. One change since the last update stems from Bhima's (questionnaire reply, 1998a) observation that elephants now occur only in the northern hills of Nyika National Park. No information has been received to contradict Sherry's 1994 aerial survey results which pointed to the extirpation of the elephants in the Majete Wildlife Reserve (Sherry, 1996).

Surveys and data

A total aerial count was undertaken in Liwonde National Park in 1995 for the ELESMAP project (Craig, 1996), which replaced the earlier estimate from 1993. Aerial counts were conducted in Nyika National Park and Vwaza Marsh in 1997 (AHT International, 1997), Kasungu National Park in 1995 (Bhima, 1996) and in the Nkhotakota Wildlife Reserve in 1995 (JOFCA, 1997). These survey estimates replace those from earlier sample surveys described by Mkanda (1993). In addition to the surveys, reconnaissance flights were made over the Mangochi, Namizimu and Phirilongwe Forest Reserves.

The number of elephants in the **Definite** category has remained relatively stable since the last update but the number of elephants in the **Possible** and **Probable** categories has tripled. This is mainly explained by the large difference between the JOFCA (1997) survey estimate for Nkhotakota Wildlife Reserve and that of the Mkanda survey of the same area in 1992. The 1992 survey produced wide confidence limits and was relative unreliable (Mkanda, questionnaire reply, 1993). Estimates for both the Thuma and Phirilongwe Forest Reserves have been upgraded to Category D based on new information from Munthali (pers. comm., 1998). However, he has noted that due to severe poaching in Phirilongwe there are no longer more than 50 elephants, while in Thuma, because of a slight improvement in law enforcement, there are between 30 to 50 elephants (Munthali, pers. comm., 1998). The Vwaza Marsh survey of 1997 (AHT International, 1997) was a sample count during which only a single animal was seen. However, an additional 35 animals were counted outside the sampling area and the survey has therefore been classified as a low intensity aerial total count, giving a minimum (**Definite**) of 35 elephants.

Cross-border movements

There may be cross-border movements between Malawi and Zambia but information is lacking.

Issues

While law enforcement measures are fairly strict, pressure on protected area resources (both land and wildlife) remains high, and excising of land from protected areas for agricultural purposes is not uncommon (Mkanda, 1992). However, there is a new Wildlife Act which stipulates stiffer penalties for illegal use of protected areas and natural resources (Bhima, questionnaire reply, 1998b), and it is hoped that through this Act, such activities will be curbed.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Malawi

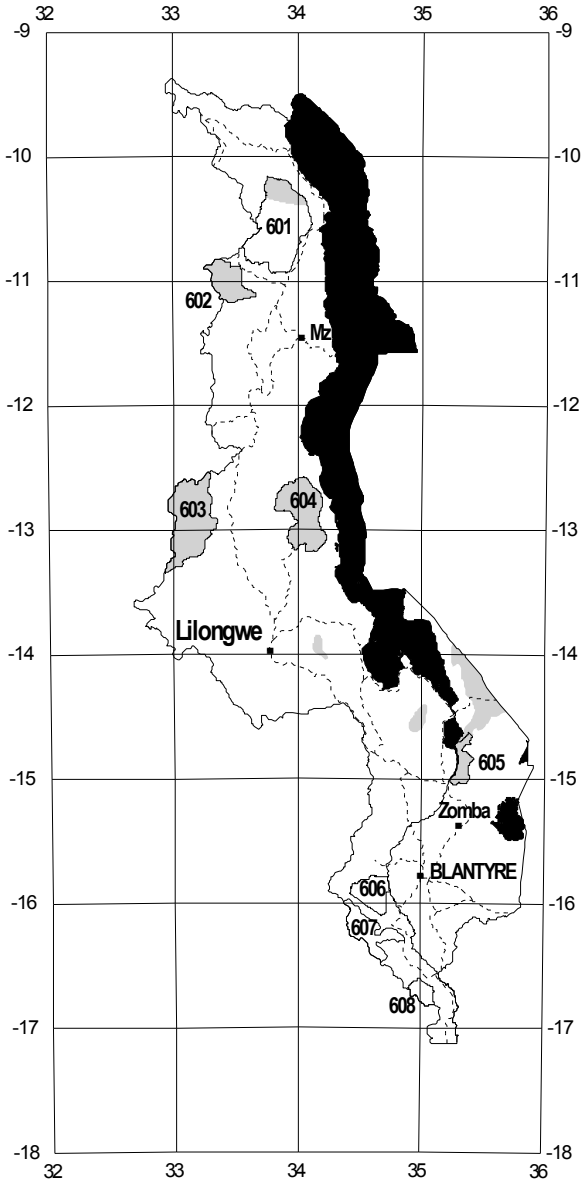
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Nyika National Park	1997	3,134	339	239	0.11	AHT International, 1997	AS1	B
102	Vwaza Marsh Wildlife Reserve	1997	986	35		0.04	AHT International, 1997	AT3	A
103	Kasungu National Park	1995	2,316	391	349	0.17	Bhima, 1996	AS2	B
104	Nkhota-Kota Wildlife Reserve	1995	1,802	1,037	1,511	0.58	JOFCA, 1997	AS2	B
105	Liwonde National Park	1995	538	414		0.77	Bhima, 1996	AT3	A
201	Thuma Forest Reserve	1998	370	30	20*	0.08	Munthali, pers. comm., 1998	IG3	D
202	Phirilongwe Forest Reserve	1998	640	50		0.08	Munthali, pers. comm., 1998	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR MALAWI

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	449	0	0	0
B	Aerial or Ground Sample Counts	198	1,569	1,569	0
C	Dung Counts	0	0	80	0
D	Informed Guesses	0	0	0	20
E	Other Guesses	0	0	0	0
TOTAL		**647**	**1,569**	**1,649**	**20**

PROTECTED AREAS AND ELEPHANT RANGE IN MALAWI



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 7,000,000

KEY TO PROTECTED AREAS

National Park
601 Nyika
603 Kasungu
605 Liwonde
607 Lengwe

Wildlife Reserve
602 Vwaza Marsh
604 Nkhota-Kota
606 Majete
608 Mwabvi

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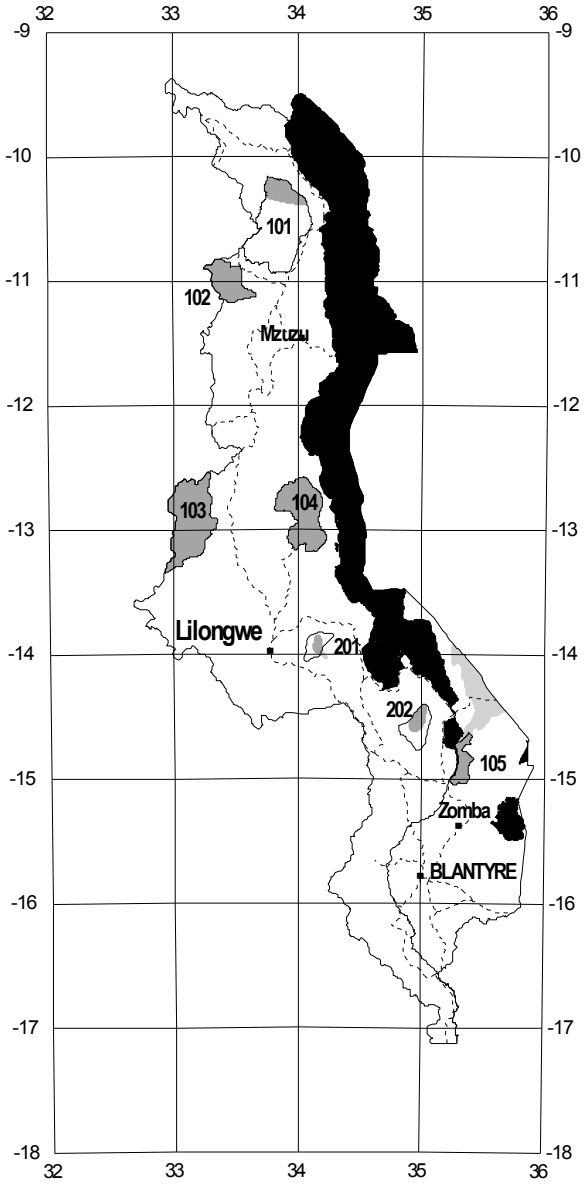
SURVEY ZONES AND ELEPHANT RANGE IN MALAWI



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 7,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Nyika National Park	339
102	Vwaza Marsh Wildlife Reserve	35
103	Kasungu National Park	391
104	Nkhota-Kota Wildlife Reserve	1,037
105	Liwonde National Park	414
201	Thuma Forest Reserve	30
202	Phirilongwe Forest Reserve	50

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MOZAMBIQUE

General Statistics

Country area:	801,590km^2
Range area (% of country):	467,062km^2 (58%)
Protected area coverage (% of country):	4%
Protected range (% of range in protected areas):	6%

Range

There are three distinct elephant ranges in Mozambique, in the north, central and southern portions of the country. The range boundaries must be considered with caution, as little of the portrayed range has been surveyed.

Surveys and data

Survey work has been sporadic since the end of civil war. Due to lack of funds and local expertise, relatively few surveys have been undertaken. Estimates were provided for Maputo (including Futi, as the elephants move freely between these two areas), Niassa, Lugenda/Ruvuma, Gaza, Manica and Zambezia. An aerial survey was carried out over Niassa during September 1998, which estimated more than 8,700 elephants for the Niassa Game Reserve and Buffer (Gibson, 1998). The Magoe District estimate was provided by Mackie and Chafota (1995) from an aerial survey.

Chambal (questionnaire reply, 1998a) and Munthali (pers. comm., 1998) provided the remaining estimates of elephant populations occurring throughout the country. These estimates have been classified as informed guesses because elephants were actually seen on several occasions. One-hundred and eighty elephants were seen in Maputo by I. Whyte (de Boer, pers. comm., 1998) in flights made from South Africa. Chambal flew the Lugenda/Rovuma area in June 1998 in a reconnaisance foray and saw elephants (Munthali, pers. comm., 1998) and Chambal used field notes, annual reports on safaris and hunting expeditions to summarise estimates for the Middle Zambezi and Futi (Chambal, questionnaire reply, 1998a)

Cross-border movements

There are elephant movements between Mozambique and South Africa. There may also be cross-border movements into Tanzania and Zimbabwe.

Issues

The elephant population in Mozambique has declined by about 50% over the past three decades, mainly as a result of civil unrest. Although there have been no systematic studies on elephant populations since the onset of the civil war, recent estimates based on provincial reports and guess estimates indicate that there may be between 15,000 to 20,000 elephants, residing mainly in the northern and central parts of Mozambique (DNFFB, 1998).

During the civil war many people were displaced or fled their traditional lands, becoming refugees in their own country or in neighbouring countries. With the increased availability of land and fewer chances of contacts with humans, elephants began expanding and/or changing their range patterns to include the vacated areas. However, with the establishment of peace, refugees began returning home, thus coming into direct conflict with elephants in their newly established range. There are now reports from the Provinces of Inhambane, Sofala, Niassa, Zambezia and Maputo of crop-raiding by elephants (DNFFB, 1998). To help mitigate the growing number of conflicts, there is a revision of the Wildlife and Forest Act which will enhance the conservation of elephant through community-based wildlife management in communal areas (Chambal, questionnaire reply, 1998b).

The transfrontier conservation areas in the southern part of Mozambique which link Maputo Elephant Reserve and Tembe in South Africa, and the Kruger National Park in South Africa and Chimanimani, have been expanded. This should encourage elephant migrations and assist in the exchange of information on poaching incidents among the countries concerned (Chambal, questionnaire reply, 1998b).
In 1990, following a CITES decision to place the African elephant on Appendix I, the Government of Mozambique took the decision to ban elephant hunting as an attempt to control trade and to allow the species to

recover. There are now talks of re-opening sport-hunting of elephants, even though there is insufficient information on which to base this decision (DNFFB, 1998). However, there have been reports of elephant trophy hunting by foreign nationals under the current hunting ban in Niassa Game Reserve.

Poaching has occurred in both Maputo Game Reserve and Niassa Game Reserve during 1996 and 1997. No exact numbers killed are known, although in Maputo Game Reserve one elephant with a radio collar was killed (Chambal, questionnaire reply, 1998b).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

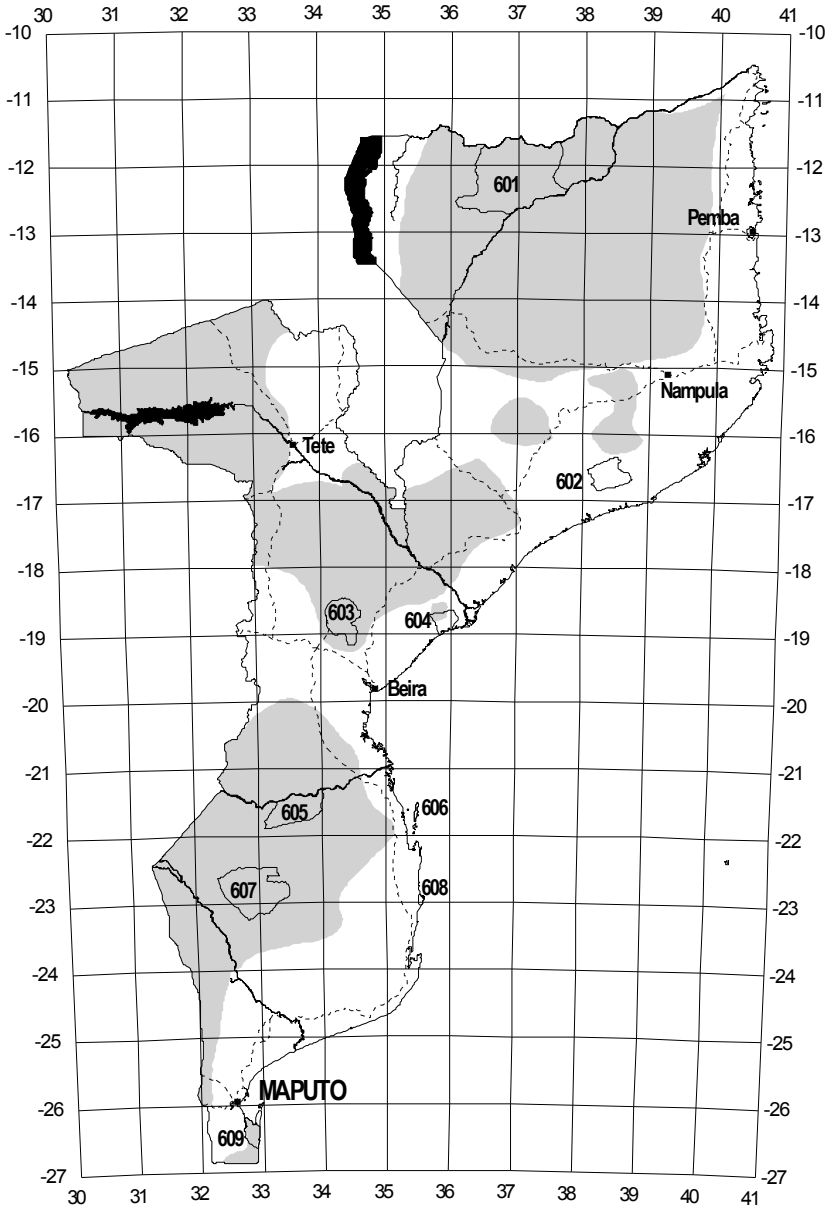
Mozambique

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
201	Magoe District	1995	3,815	137	187	0.04	Mackie and Chafota, 1995	AS2	B
202	Gaza	1998		200			Munthali, pers. comm., 1998	IG3	D
203	Lugenda/Rovuma	1998		300			Munthali, pers. comm., 1998	IG3	D
204	Manica	1998		250			Munthali, pers. comm., 1998	IG3	D
205	Zambezia	1998		1,500			Munthali, pers. comm., 1998	IG3	D
301	Niassa Game Reserve and Buffer	1998	42,349	8,707	1,937	0.21	Gibson, 1998	AS2	B
302	Maputo Game Reserve and Futi Corridor	1998	900	300		0.33	Munthali, pers. comm., 1998	IG3	D

SUMMARY OF TOTALS FOR MOZAMBIQUE

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	6,898	1,946	1,946	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	2,550	0
E	Other Guesses	0	0	0	0
TOTAL		**6,898**	**1,946**	**4,496**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN MOZAMBIQUE



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 13,000,000

KEY TO PROTECTED AREAS

National Park
603 Gorongosa
605 Zinave
606 Bazaruto
607 Banhine

Game Reserve
601 Niassa
602 Gile
604 Marromeu
608 Pomene
609 Maputo

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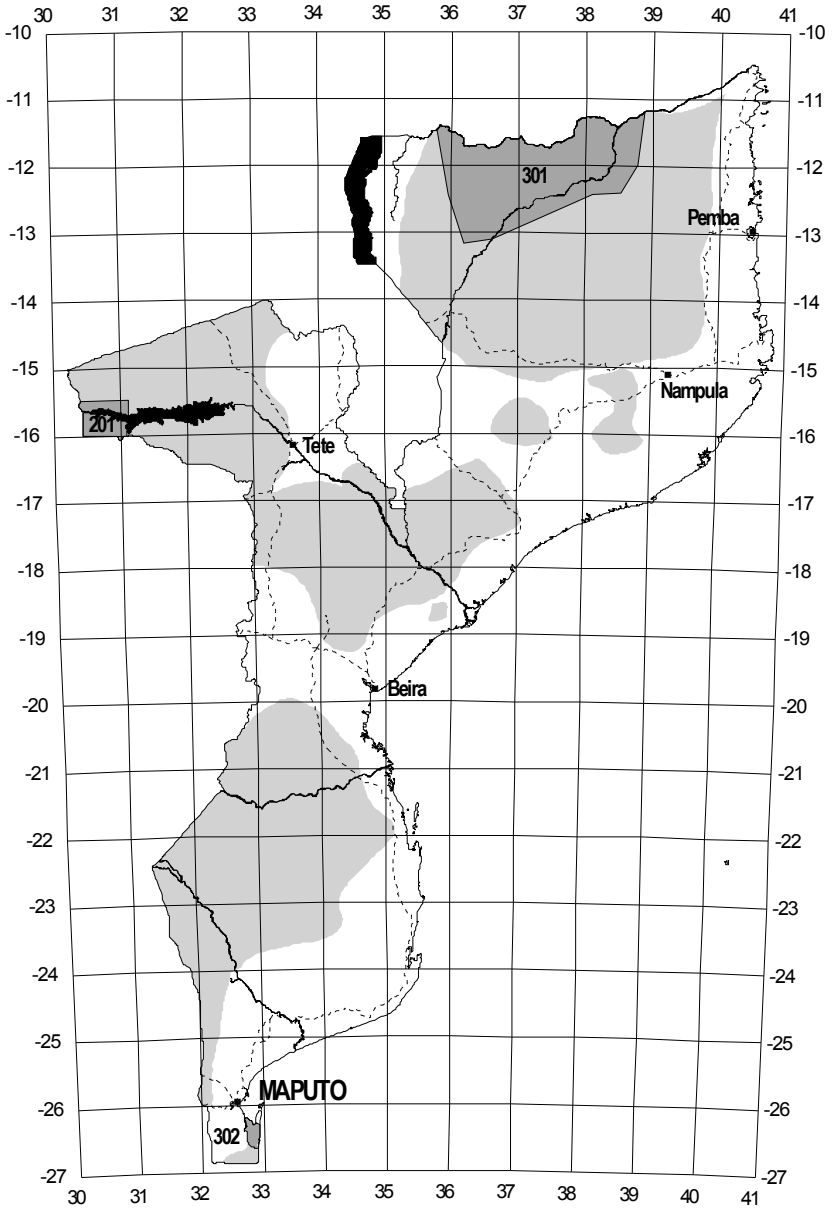
SURVEY ZONES AND ELEPHANT RANGE IN MOZAMBIQUE



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 13,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Magoe District	137
301	Niassa Game Reserve and Buffer	8,707
302	Maputo Game Reserve and Futi Corridor	300

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NAMIBIA

General Statistics

Country area:	825,418km^2
Range area (% of country):	145,015km^2 (18%)
Protected area coverage (% of country):	12%
Protected range (% of range in protected areas):	20%

Range

Historically, elephant populations occurred throughout Namibia, although they were sparse and widely scattered in the south. Today elephants are restricted to the north, where their movements for any particular year are dependent on rainfall patterns across the country. Namibia is extremely dry and the elephants have some of the largest home ranges recorded (Osborne and Welford, 1996) and are amongst the most nomadic of any elephants on the continent (Lindeque, 1995). Elephants in Namibia occupy a variety of habitats from desert (Kaokoveld area) to woodland, but the populations all tend to be migratory. Etosha National Park, Kaudom Game Reserve and the Caprivi region are protected areas which harbour large populations within this range, but the overall area of range extends much further.

Surveys and data

All the major elephant habitats of Namibia were surveyed in 1995. Sample aerial counts were conducted in Etosha National Park, Kavango, Caprivi and Khaudom/Tsumkwe (Lindeque *et al.*, 1995). One aerial total count was carried out in Kunene (Lindeque *et al.*, 1995). A large portion of elephant range in Namibia has now been surveyed. Elephant estimates have changed little since the last update, although overall survey quality has improved, which is reflected in the increased proportion of estimates in the **Definite** category.

In the conservancies, there are ongoing monitoring/surveying activities by community game guards and resource monitors. A seasonal elephant distribution and mortality monitoring system has also been established (Lindeque, questionnaire reply, 1998), which should provide more data on elephants in the future.

Cross-border movements

Cross-border movements occur mainly between Namibia (Caprivi strip), northern Botswana and Zimbabwe (Craig, 1996), Angola and possibly Zambia.

Issues

Since Namibia gained independence from South Africa in 1990 there has been increasing pressure for land and tenure. Areas previously unsettled are now being occupied, creating a potential conflict situation in mainly elephant habitat. New legislation has been enacted which provides for the establishment of conservancies and local ownership of elephants. This has stimulated the establishment of large conservancies on communal land, which are *de facto* protected areas and cover virtually all important elephant range outside protected areas (Lindeque, questionnaire reply, 1998). Promulgation of the Trust Fund Act allows revenue from ivory and hunting of elephants to be allocated to conservation programmes (Lindeque, questionnaire reply, 1998).

Namibia's government is in the process of investigating the creation of transfrontier conservation areas to strengthen elephant conservation (Lindeque, questionnaire reply, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

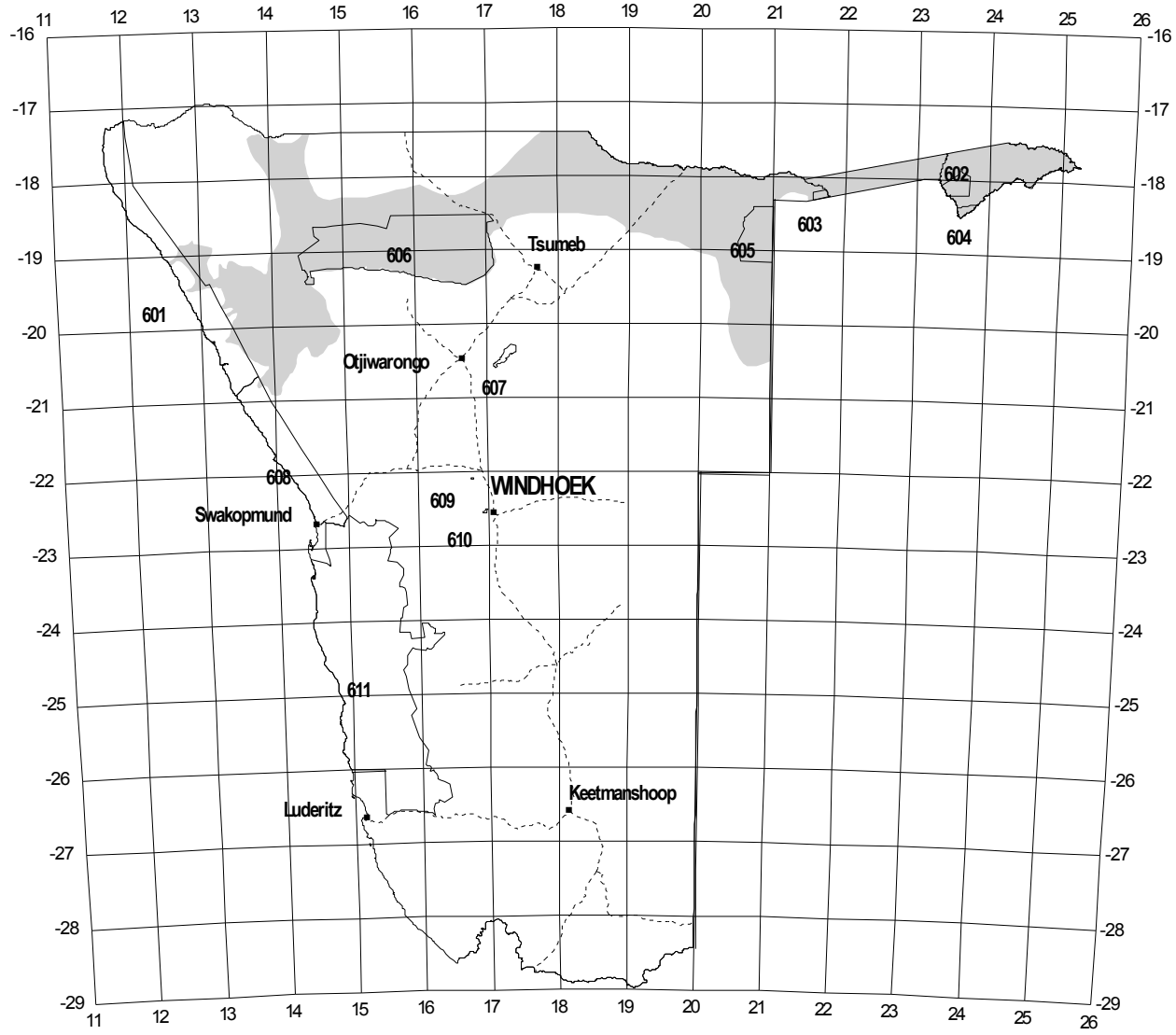
Namibia

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Etosha National Park	1995	22,270	1,189	410	0.05	Lindeque *et al.*, 1995	AS1	B
201	Kavango	1995	6,930	19		0.00	Lindeque *et al.*, 1995	AS1	D
301	Caprivi	1995	19,290	4,883	1,247	0.25	Lindeque *et al.*, 1995	AS2	B
302	Kunene	1995	42,885	508		0.01	Lindeque *et al.*, 1995	AT3	A
303	Kaudom/Tsumkwe	1995	15,020	1,085	545	0.07	Lindeque *et al.*, 1995	AS2	B

SUMMARY OF TOTALS FOR NAMIBIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	508	0	0	0
B	Aerial or Ground Sample Counts	5,736	1,421	1,421	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	19	0	0	0
E	Other Guesses	0	0	0	0
TOTAL		**6,263**	**1,421**	**1,421**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN NAMIBIA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 11,000,000

KEY TO PROTECTED AREAS

National Park
602 Mudumo
604 Mamili
606 Etosha

Game Park
601 Skeleton Coast
603 Mahango
605 Kaudom
607 Waterberg Plateau

609 Gross Barmen Hot Springs
610 Daan Viljoen
611 Namib Naukluft

Recreation Area
608 National West Coast Tourist

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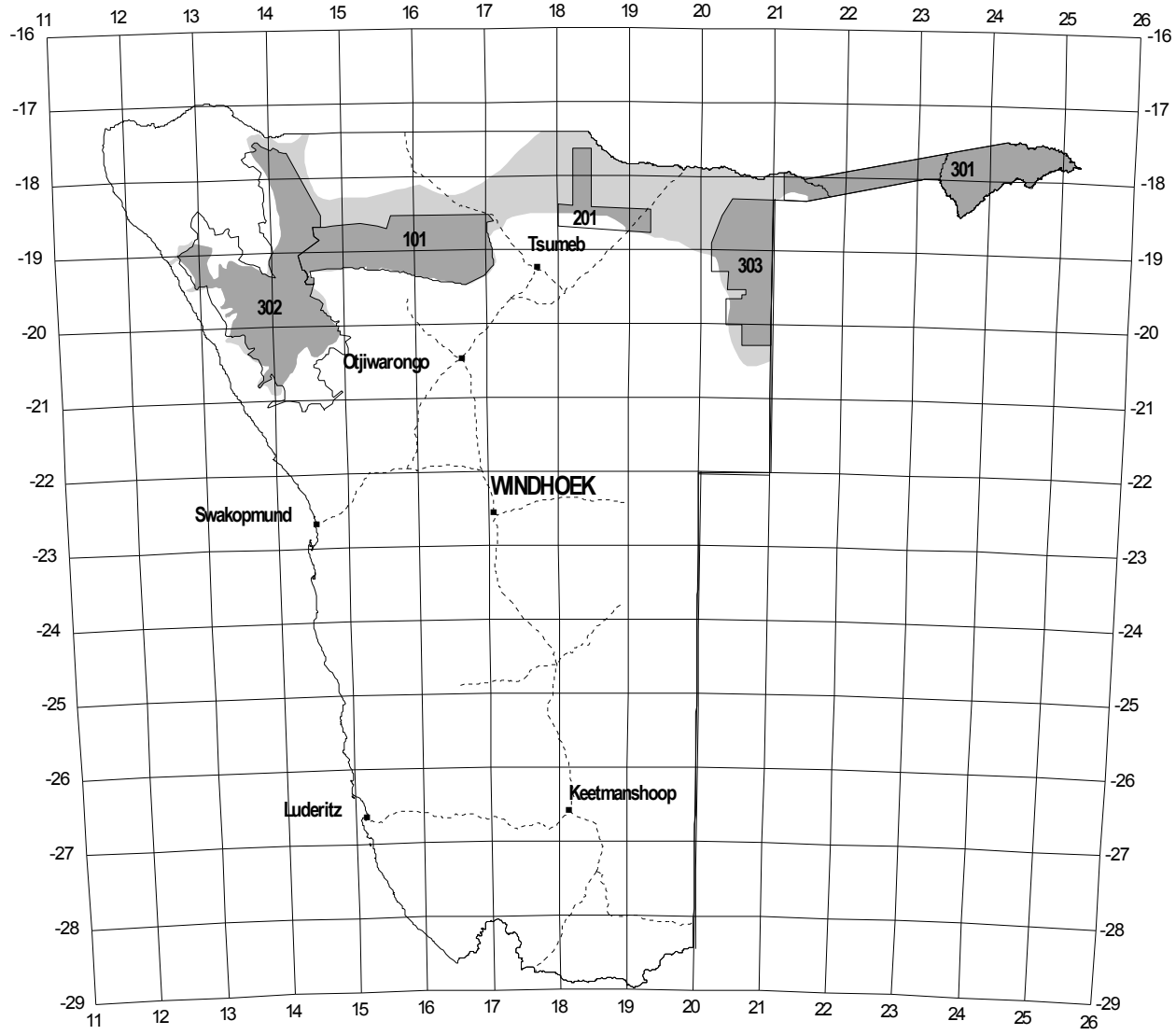
SURVEY ZONES AND ELEPHANT RANGE IN NAMIBIA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 11,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Etosha National Park	1189
201	Kavango	19
301	Caprivi	4883
302	Kunene	508
303	Kaudom/Tsumkwe	1085

N

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SOUTH AFRICA

General Statistics

Country area:	1,219,912km^2
Range area (% of country):	25,847km^2 (2%)
Protected area coverage (% of country):	4%
Protected range (% of range in protected areas):	92%

Range

Because most of South Africa's elephants live within protected areas, the populations are relatively well known and the range estimates are accurate.

The largest portion of elephant range falls within and around Kruger National Park. The area includes some range outside the park, adjacent to its southwestern borders. The remaining elephant populations are distributed in small parks and private reserves scattered across the country.

Surveys and data

South Africa's elephant population recovered from a low of 120 animals in 1920 (Hall-Martin, 1992) to almost 12,000 today. About 75% of South Africa's elephants are found in the Kruger National Park, where an aerial total count is carried out annually from helicopters (Whyte and Wood, 1996, 1997). The other two major elephant habitats are Addo Elephant National Park and Hluhluwe-Umfulozi Park. According to the latest surveys, the Addo Elephant National Park elephant population is continuing to grow at an annual rate of 4.7% (Castley and Knight, 1998).

There are 20 protected areas and many private reserves with elephant populations for which updated estimates have been provided in 1997 or 1998. South Africa is unique because all the estimates are obtained from either total counts (from the ground or air) or from individual registration. Therefore all the elephants are counted, providing a **Definite** estimate with no elephants in the **Probable**, **Possible** or **Speculative** categories. However, there are cross-border movements of elephants from other countries which are not accounted for in the overall country estimate.

One overall estimate has been given for the elephants which occupy private reserves in South Africa (Garai, pers.comm., 1998a). This is because the members of the Elephant Management and Owners Association (EMOA), an organisation of private landowners, requested that the details remain confidential, since landowners are extremely cautious due to past poaching incidents.

Cross-border movements

South Africa's only cross-border population may be between the Kruger National Park and Tembe Elephant Park and southern Mozambique, although there is a fence along the border with Kruger and Mozambique which limits movement.

Issues

South Africa, which has been practicing culling of its herds, particularly those in the Kruger National Park, suspended culling operations in 1994, but in 1995, 44 bulls were culled in areas of Kruger National Park where problems had been experienced (Whyte and Wood, 1996). Elephants are still being captured and translocated from Kruger to other parts of the country, and in 1996, 148 elephants were removed from the Park (Whyte and Wood, 1996). As another means of controlling elephant populations, South Africa has been experimenting with elephant contraception in Kruger National Park. While the results are not fully known, preliminary information seems to indicate that the methods still require further development and that Kruger is too large an area for contraception to effectively regulate population numbers (Whyte and Grobler, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

South Africa

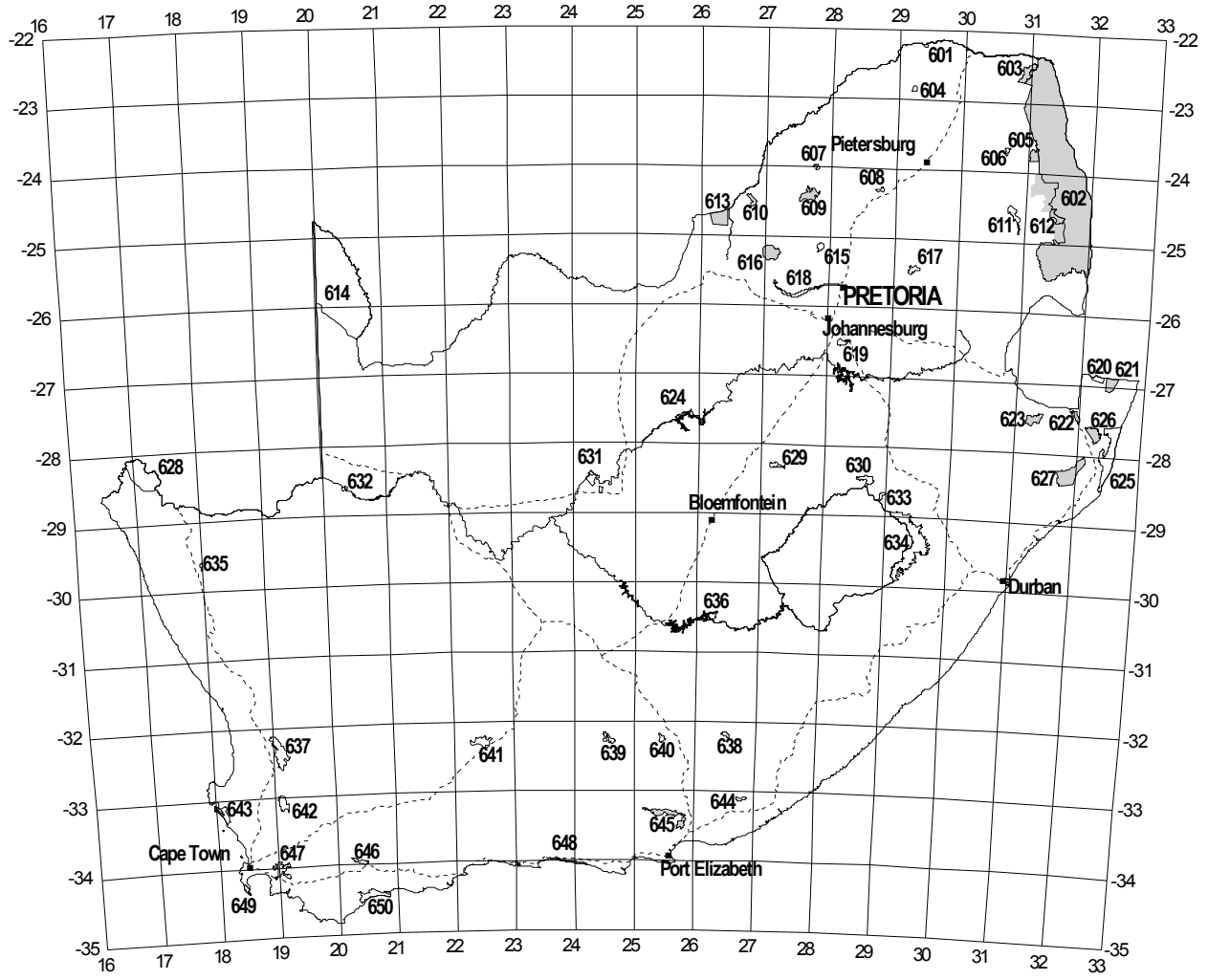
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Kruger National Park	1998	19,624	8,869		0.45	Whyte, in prep.	AT3	A
102	Makuya National Park	1997	165	8		0.05	Whyte and Wood, 1997	AT3	A
103	Letaba Ranch	1997	420	58		0.14	Garai, pers. comm., 1998b	AT3	A
104	Marakele National Park	1998	380	48		0.13	Knight, quest. reply, 1998	IR1	A
105	Atherstone Nature Reserve	1997	136	24		0.18	Garai, pers. comm., 1998b	AT3	A
106	Manyeleti Game Reserve	1997	228	28		0.12	Garai, pers. comm., 1998b	AT3	A
107	Madikwe Nature Reserve	1998	700	282		0.40	Garai, pers. comm., 1998c	AT3	A
108	Pilanesberg National Park	1997	553	87		0.16	Garai, pers. comm., 1998b	AT3	A
109	Tembe Elephant Park	1997	300	115		0.38	Balfour, pers. comm., 1998	AT3	A
110	Pongolapoort Nature Reserve	1997	119	20		0.17	Balfour, pers. comm., 1998	IR1	A
111	Itala Nature Reserve	1997	297	45		0.15	Balfour, pers. comm., 1998	GT1	A
112	Mkuzi Game Reserve	1997	380	25		0.07	Balfour, pers. comm., 1998	IR1	A
113	Hluhluwe-Umfolozi Park	1997	965	250		0.26	Balfour, pers. comm., 1998	GT1	A
114	Addo Elephant National Park	1998	513	272		0.53	Castley and Knight, 1998	AT1	A
201	Phalaborwa Mining Co.	1997	41	42		1.02	Whyte and Wood, 1997	AT3	A
202	Klaserie Private Nature Reserve	1997	628	303		0.48	Whyte and Wood, 1997	AT3	A
203	Umbabat Private Nature Reserve	1997	144	134		0.93	Whyte and Wood, 1997	AT3	A

204	Timbavati Private Nature Reserve	1997	784	322	0.41	Whyte and Wood, 1997	AT3	A
205	Sabie Sand Game Reserve	1997	572	311	0.54	Garai, pers. comm., 1998b	AT3	A
206	Knysna State Forest	1997	300	3	0.01	Garai, pers. comm., 1998b	IR1	A
207	Private Reserves	1997		659		Garai, pers. comm., 1998a	GT1	A

SUMMARY OF TOTALS FOR SOUTH AFRICA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	11,905	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	0
TOTAL		**11,905**	**0**	**0**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN SOUTH AFRICA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 12,000,000

KEY TO PROTECTED AREAS

National Park
601 Limpopo Valley
602 Kruger
609 Marakele
614 Kalahari Gemsbok
615 Borakalalo
616 Pilanesberg
628 Richtersveld
630 Golden Gate Highlands
631 Vaalbos
632 Augrabies Falls
633 Royal Natal
640 Mountain Zebra
641 Karoo
643 West Coast
645 Addo Elephant
648 Tsitsikamma

Game Reserve
612 Manyeleti
620 Ndumu
626 Mkuzi
629 Willem Pretorius

Nature Reserve
604 Langjan
606 Hans Merensky
607 Hans Strijdom
608 Doorndraai Dam
610 Atherstone
611 Blyde River
613 Madikwe
617 Loskop Dam
619 Suikerbosrand
622 Pongolapoort
623 Itala
624 Bloemhof Dam
635 Goegab
636 Tussen die Riviere
639 Karoo
644 Andries Vosloo Kudu
646 Marloth
647 Hottentots Holland
649 Cape of Good Hope
650 De Hoop

Park
603 Makuya
621 Tembe Elephant
627 Hluhluwe-Umfolozi
634 Natal Drakensberg

Game Park
638 Tsolwana

Protected Natural Environment
618 Magaliesberg

Ranch
605 Letaba

Wetland Park
625 Greater St. Lucia

Wilderness Area
637 Cederberg
642 Groot Winterhoek

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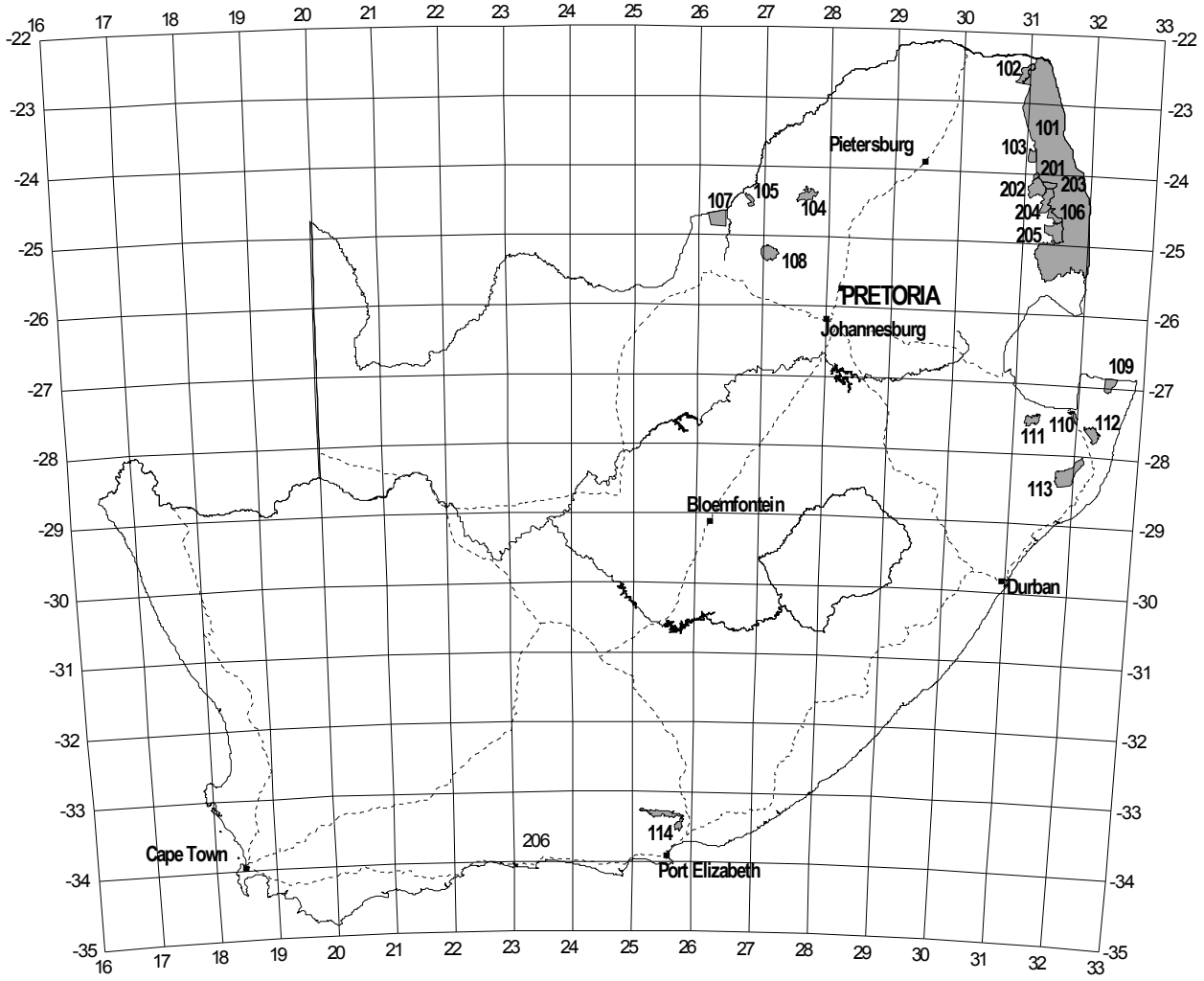
SURVEY ZONES AND ELEPHANT RANGE IN SOUTH AFRICA



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 12,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Kruger National Park	8869
102	Makuya National Park	8
103	Letaba Ranch	58
104	Marakele National Park	48
105	Atherstone Nature Reserve	24
106	Manyeleti Game Reserve	28
107	Madikwe Nature Reserve	282
108	Pilanesberg National Park	87
109	Tembe Elephant Park	115
110	Pongolapoort Nature Reserve	20
111	Itala Nature Reserve	45
112	Mkuzi Game Reserve	25
113	Hluhluwe-Umfolozi Park	250
114	Addo Elephant National Park	272
201	Phalaborwa Mining Co.	42
202	Klaserie Private Nature Reserve	303
203	Umbabat Private Nature Reserve	134
204	Timbavati Private Nature Reserve	322
205	Sabie Sand Game Reserve	311
206	Knysna State Forest	3
207*	Private Reserves	641

* Not shown on map

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SWAZILAND

General Statistics

Country area:	17,360km^2
Range area (% of country):	188km^2 (1%)
Protected area coverage (% of country):	2%
Protected range (% of range in protected areas):	0%

Range

Elephant distribution is well known in Swaziland, being restricted to only two areas, Hlane Game Sanctuary and Mkhaya Nature Reserve.

Surveys and data

Total counts with individual registration of all animals have been maintained for both populations in Swaziland. The estimates for both Mkhaya and Hlane were updated in 1998 by Ted Reilly (Whyte, pers. comm., 1998).

Cross-border movements

There are no cross-border movements.

Issues

Swaziland's elephants were eliminated in the early 1900s. However, in 1986, elephants were translocated from South Africa to Swaziland. The population has grown from an initial 20 animals to the 39 today. Poaching was a problem in the past but there have been no incidents in recent years.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELAIBILITY is keyed from A (best) to E (worst)

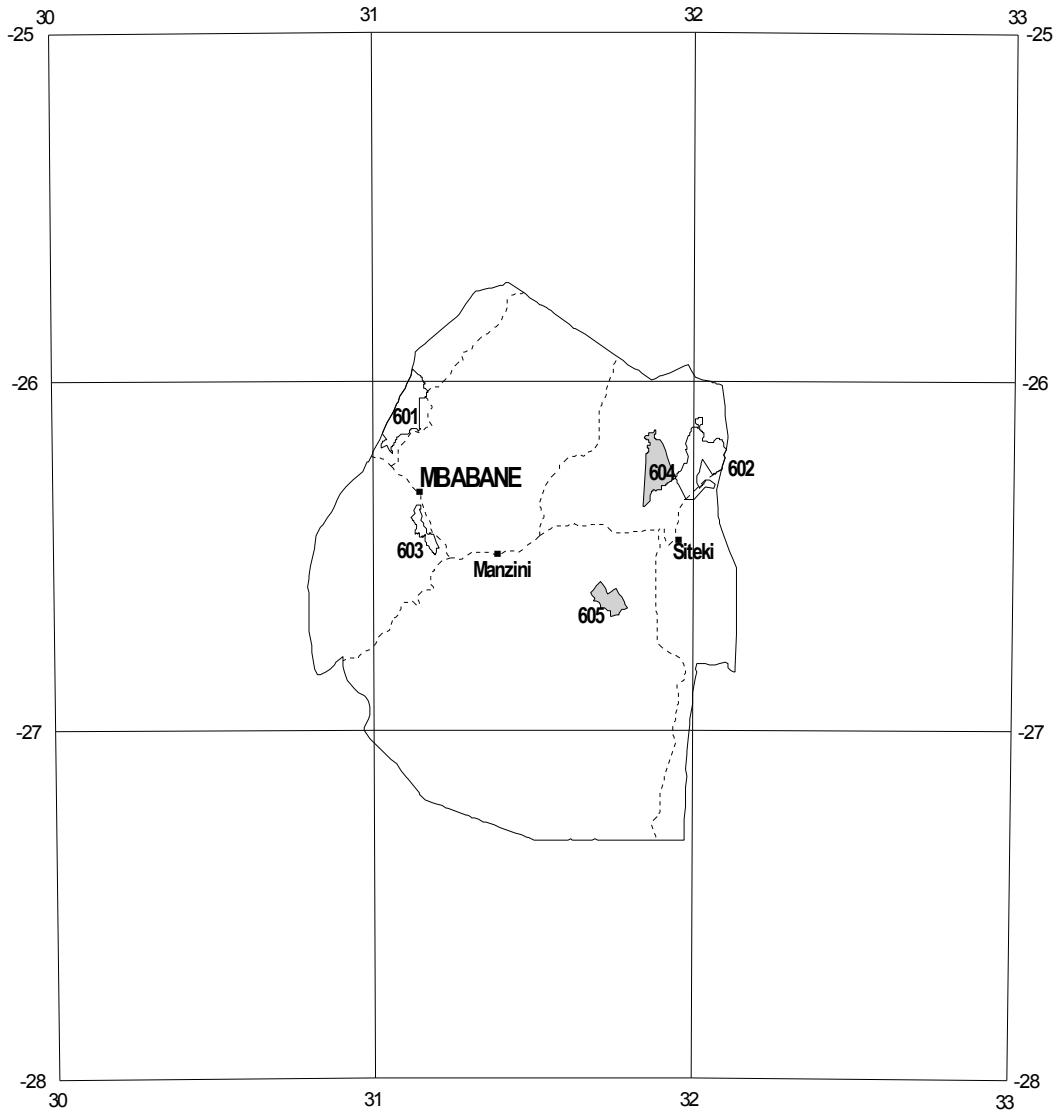
Swaziland

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
201	Hlane Game Sanctuary	1998	142	20		0.14	Whyte, pers. comm., 1998	IR1	A
202	Mkhaya Nature Reserve	1998	65	19		0.29	Whyte, pers. comm., 1998	IR1	A

SUMMARY OF TOTALS FOR SWAZILAND

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	39	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	0
TOTAL		**39**	**0**	**0**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN SWAZILAND



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 2,500,000

KEY TO PROTECTED AREAS

Nature Reserve
601 Malolotja
602 Mlawula
605 Mkhaya

Game Sanctuary
603 Mlilwane
604 Hlane

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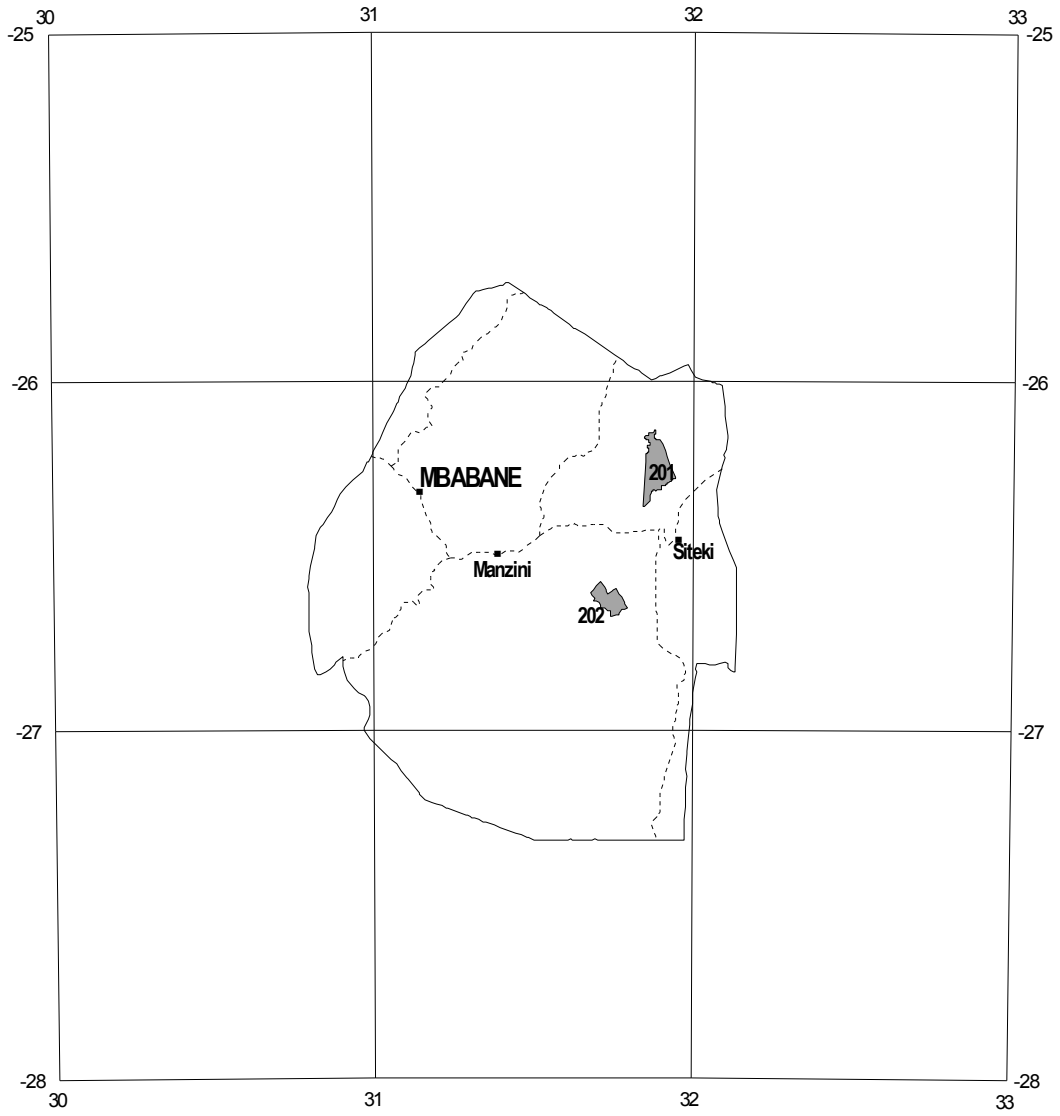
SURVEY ZONES AND ELEPHANT RANGE IN SWAZILAND



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 2,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Hlane Game Sanctuary	20
202	Mkhaya Nature Reserve	19

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ZAMBIA

General Statistics

Country area:	752,610km^2
Range area (% of country):	208,123km^2 (28%)
Protected area coverage (% of country):	8%
Protected range (% of range in protected areas):	25%

Range

The designation of elephant range for Zambia has not been changed since the last update. It is, however, thought to be accurate, since most range lies within protected areas, with a smaller proportion outside protected or surveyed areas. In southwestern Zambia, the elephant range is contiguous with the Botswana and Zimbabwe range as well as with that of DRC in the north and Mozambique to the east.

Three areas which were surveyed since the last update revealed no elephants: Luambe National Park, Lunga Luswishi Game Management Area and Chisomo Game Management Area. These areas were retained in the AED as survey zones with elephant range as there were no indications that the elephants had left permanently (Jachmann, 1996).

Surveys and data

Twenty-four of the 32 survey zones listed in the last update have been surveyed since 1995, 22 of which have been surveyed by aerial sample counts of varying quality and reliability. There are now 4,000 fewer elephants placed in the **Definite** category for Zambia, while the numbers of **Possible** and **Probable** estimates remain the same. This is partially explained by the survey estimates for both South and North Luangwa National Parks, which had very wide confidence limits, thus reducing the number contributing to the **Definite** category. The survey of Siomo-Ngwezi National Park (Mwiya, 1996) developed logistical problems when the survey aircraft broke down during the survey, delaying it by five days so that it was not a continuous count. During the five-day period a sudden change of climate, from dry to wet, affected the movement of elephants and the survey recorded a zero estimate within the park though 250 elephants were seen beyond the streamers. For analysis, these elephants have been placed in the **Definite** category and the survey is treated as a low intensity aerial total count.

Cross-border movements

Cross-border movements of elephants possibly occur between Zambia, Angola, Namibia (Mwiya, 1996), Botswana and Zimbabwe to the south (Craig, 1996), Malawi to the east and DRC to the north.

Issues

Approximately 15km^2 of the eastern portion of the Lower Zambezi National Park has been encroached upon by local communities in search of land and resources (Saiwana, questionnaire reply, 1998). As a result, part of the park has been lost, but it should have no effect on the elephant population.

Elephant hunting has been banned in Zambia and the penalties for elephant poaching have been increased substantial as a deterrence to potential poachers (Saiwana, questionnaire reply, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Zambia

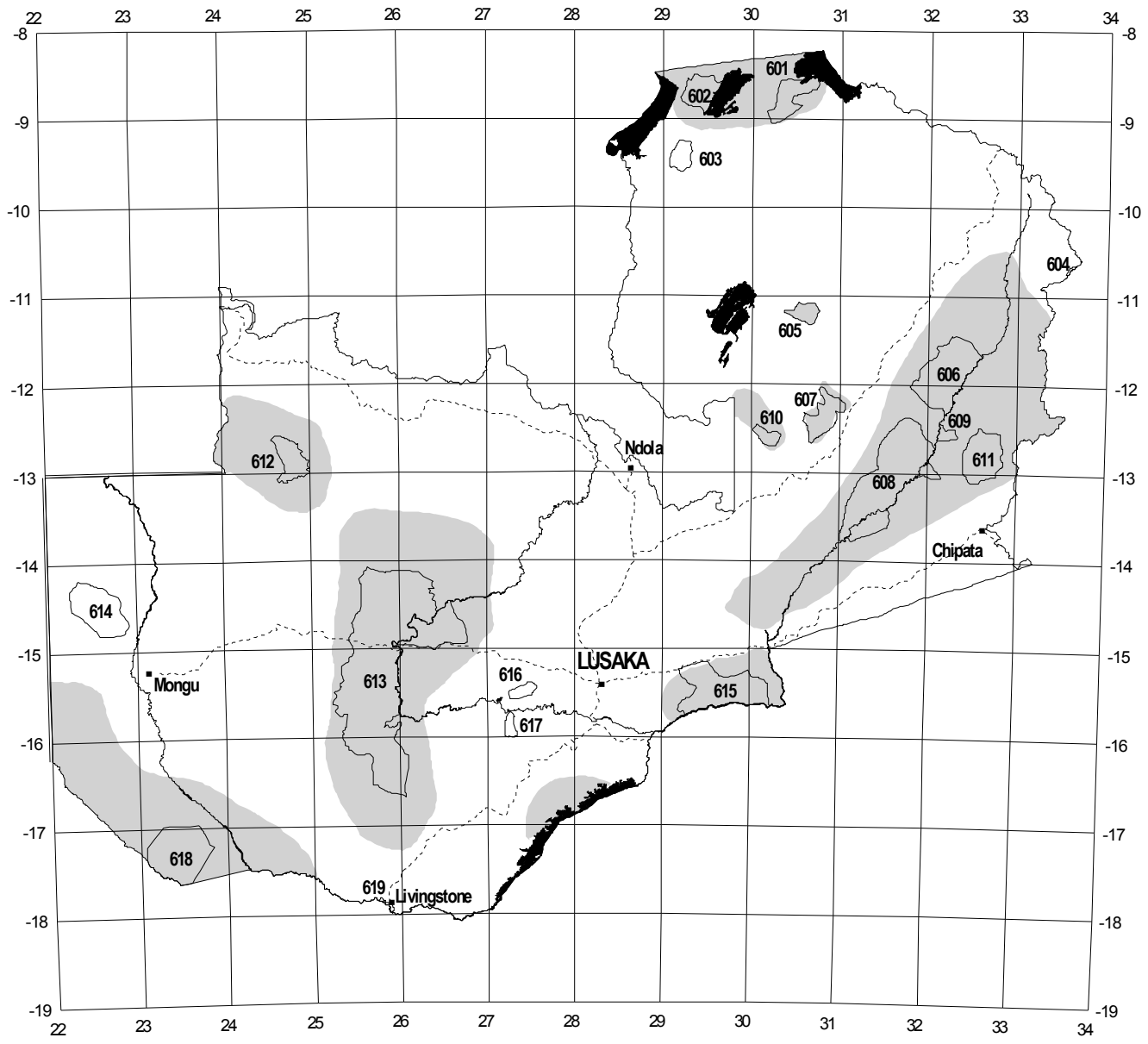
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Nsumbu National Park	1998	2,063	45		0.02	Saiwana, pers. comm., 1998	GT1	A
102	Isangano National Park	1993	840	3		0.00	Tembo, quest. reply, 1993	GT1	A
103	North Luangwa National Park	1996	4,636	3,033	2,252	0.65	Jachmann, 1996	AS3	B
105	South Luangwa National Park	1996	9,050	7,942	2,930	0.88	Jachmann, 1996	AS2	B
104	Lavushi Manda National Park	1991	1,500	15		0.01	Tembo, quest. reply, 1993	IG3	D
106	Luambe National Park	1996	254	0		0	Jachmann, 1996	AS3	B
107	Kasanka National Park	1991	390	50		0.13	Tembo, quest. reply, 1993	IG3	D
108	Lukusuzi National Park	1994	2,720	110	190	0.04	Jachmann and Kalyocha, 1994	AS2	B
109	West Lunga National Park	1996	1,684	520		0.31	Phiri, pers. comm., 1998	AS3	D
110	Kafue National Park	1997	22,400	4,482	3,222	0.20	Zyambo, 1997	AS2	B
111	Lower Zambezi National Park	1996	4,092	232	457	0.06	Phiri, 1996	AS2	B
112	Sioma Ngwezi National Park	1996	5,276	250		0.02	Mwiya, 1996	AT3	A
113	Mosi-oa-Tunya National Park	1991	66	19		0.29	Tembo, quest. reply, 1993	AT3	A
201	Musalangu Game Management Area	1996	17,350	305	690	0.02	Jachmann, 1996	AS3	B
202	Kafinde Game Management Area	1991	3,860	50		0.01	Tembo, quest. reply, 1993	IG3	D

203	Munyamadzi Game Mgt Area	1996	3,300	102	210	0.03	Jachmann, 1996	AS2	B
204	Lumimba Game Management Area	1996	4,500	763	811	0.17	Jachmann, 1996	AS3	B
205	Lupande Game Management Area	1996	4,840	892	1,394	0.18	Jachmann, 1996	AS2	B
206	Lunga-Luswishi Game Management Area	1997	13,340	0		0.00	Zyambo, 1997	AS2	B
207	Chisomo Game Management Area	1996	3,390	0		0.00	Jachmann, 1996	AS3	B
208	Sandwe Game Management Area	1996	1,530	818	1,597	0.54	Jachmann, 1996	AS2	B
209	Kasonso-Busanga Game Management Area	1997	7,780	0		0.00	Zyambo, 1997	AS2	B
210	West Petauke Game Management Area	1996	4,140	2,435	2,773	0.59	Jachmann, 1996	AS3	B
211	Luano Game Management Area	1996	8,930	150		0.02	Jachmann, 1996	IG3	D
212	Mumbwa Game Management Area	1997	3,370	124	229	0.04	Zyambo, 1997	AS2	B
213	Rufunsa Game Management Area	1996	2,328	0		0.00	Phiri, 1996	AS3	B
214	Namwala Game Management Area	1997	3,600	0		0.00	Zyambo, 1997	AS2	B
215	Chiawa Game Management Area	1996	900	48	102	0.05	Phiri, 1996	AS2	B
216	Mulobezi Game Management Area	1997	3,420	0		0.00	Zyambo, 1997	AS2	B
217	Sichifula Game Management Area	1997	3,600	374	686	0.10	Zyambo, 1997	AS2	B
218	Katokota Game Ranch	1991	15	19		1.27	Tembo, quest. reply, 1993	AT3	A
219	Nchete Island Wildlife Sanctuary	1991	25	49		1.96	Tembo, quest. reply, 1993	AT3	A
220	Sekula Island Wildlife Sanctuary	1991	10	7		0.70	Tembo, quest. reply, 1993	AT3	A

SUMMARY OF TOTALS FOR ZAMBIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	392	0	0	0
B	Aerial or Ground Sample Counts	15,481	6,179	6,179	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	785	0
E	Other Guesses	0	0	0	0
TOTAL		**15,873**	**6,179**	**6,964**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN ZAMBIA



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 8,500,000

KEY TO PROTECTED AREAS

National Park
601 Nsumbu
602 Mweru-Wantipa
603 Lusenga Plain
604 Nyika
605 Isangano
606 North Luangwa
607 Lavushi Manda
608 South Luangwa
609 Luambe
610 Kasanka
611 Lukusuzi
612 West Lunga
613 Kafue
614 Liuwa Plain
615 Lower Zambezi
616 Blue Lagoon
617 Lochinvar
618 Sioma Ngwezi
619 Mosi-oa-Tunya

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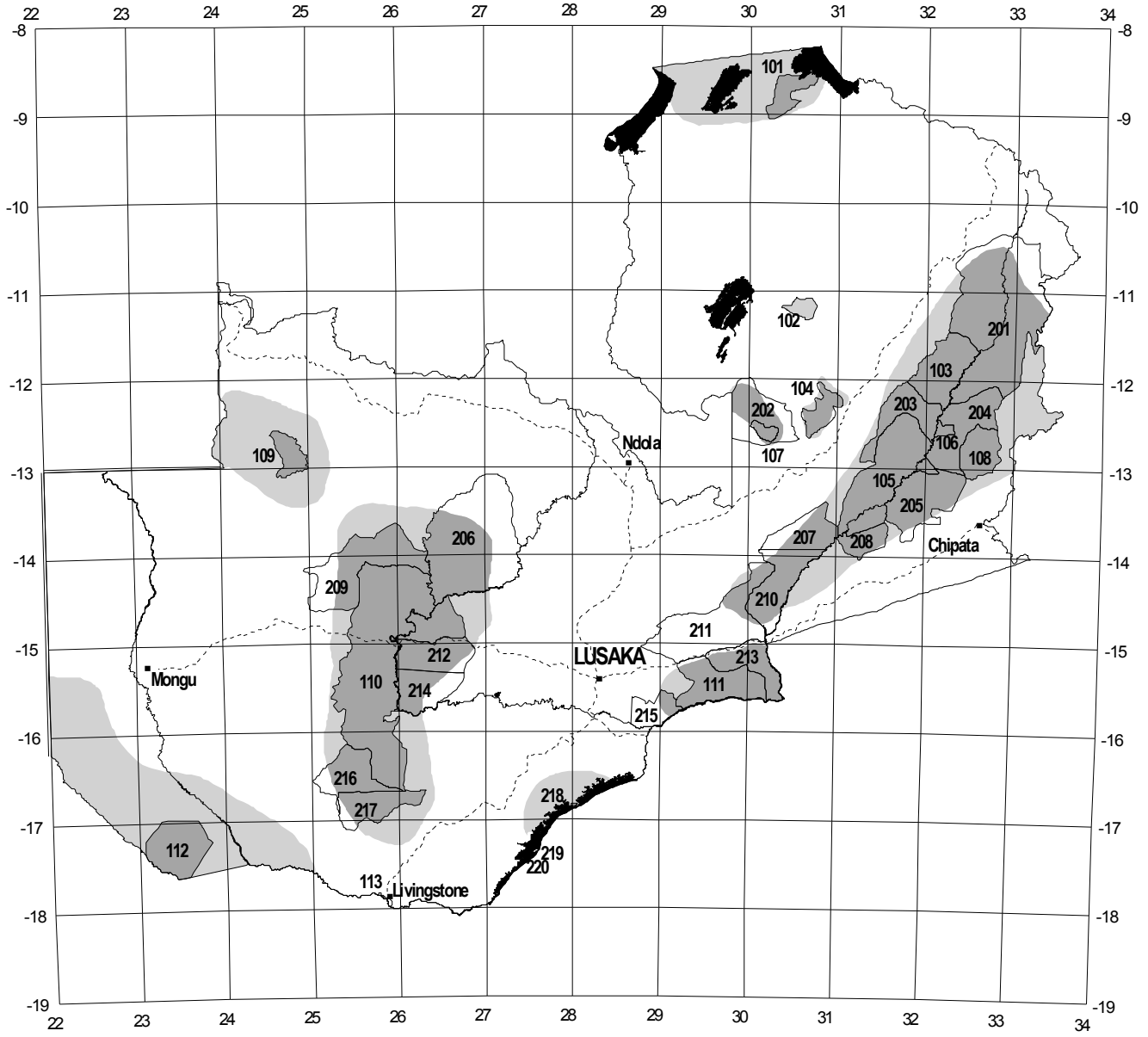
SURVEY ZONES AND ELEPHANT RANGE IN ZAMBIA



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 8,500,000

KEY TO ZONE NAMES
NP - National Park
GMA - Game Management Area
WS - Wildlife Sanctuary

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE	CODE	ZONE NAME	ESTIMATE	CODE	ZONE NAME	ESTIMATE
101	Nsumbu NP	45	201	Musalangu GMA	305	211	Luano GMA	150
102	Isangano NP	3	202	Kafinda GMA	50	212	Mumbwa GMA	124
103	North Luangwa NP	3033	203	Munyamadzi GMA	102	213	Rufunsa GMA	0
104	Lavushi Manda NP	15	204	Lumimba GMA	763	214	Namwala GMA	0
105	South Luangwa NP	7942	205	Lupande GMA	892	215	Chiawa GMA	48
106	Luambe NP	0	206	Lunga-Luswishi GMA	0	216	Mulobezi GMA	0
107	Kasanka NP	50	207	Chisomo GMA	0	217	Sichifula GMA	374
108	Lukusuzi NP	110	208	Sandwe GMA	818	218	Katokota Game Ranch	19
109	West Lunga NP	520	209	Kasonso-Busanga GMA	0	219	Nchete Island WS	49
110	Kafue NP	4482	210	West Petauke GMA	2435	220	Sekula Island WS	7
111	Lower Zambezi NP	232						
112	Sioma Ngwezi NP	0						
113	Mosi-oa-Tunya NP	19						

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ZIMBABWE

General Statistics

Country area:	390,580km^2
Range area (% of country):	109,563km^2 (28%)
Protected area coverage (% of country):	8%
Protected range (% of range in protected areas):	27%

Range

The map of elephant range was updated with information originating from the Government of Zimbabwe's proposal to CITES to transfer the Zimbabwe elephant populations to Appendix II (MET, 1997). The Government of Zimbabwe estimates that elephant range has increased over the past ten years, with elephants now occupying large-scale, privately owned farms and ranches. Many farmers in the semi-arid rangelands have grouped together to form wildlife conservancies (MET, 1997). On the whole, elephant range falls within and around protected areas and is well surveyed compared to most range states.

Surveys and data

The elephant populations of Zimbabwe have been monitored regularly by aerial surveys since the 1960s (Price Waterhouse, 1995). Data collected for this edition of the AED originate mainly from the Department of National Parks and Wild Life Management (DNPWLM) and are based almost entirely on aerial sample surveys, conducted in all types of habitat, ranging from national parks to communal lands.

All 28 survey areas have been updated with estimates made since 1995, 11 of which were from informed guesses while the remainder were from aerial sample surveys.

Aerial surveys of elephants in the Dande and Zambezi Escarpment Communal Lands were conducted by WWF (Mackie, 1997a) in 1996. However, these estimates were not used in the AED as they form part of a larger population which had been covered completely by simultaneous surveys since 1995 (Mackie, 1995; DNPWLM, 1996a). The latter survey results were therefore used, because the entire area was surveyed at one time, which gives a better indication of the actual number of elephants in the ecosystem. For these estimates, the Zambezi Valley floor contains the following protected areas: Rifa, Hurungwe Safari Area, Mana Pools Flood Plain, Mana Pools National Park, Sapi Safari Area North, Sapi Safari Area South, Chewore Safari Area North, Chewore Safari Area South, and Dande Safari Area. The Zambezi Valley Escarpment includes the following protected areas: Charara, Hurungwe I, Hurungwe II, Mana Pools, Chewore South and Chewore.

All other estimates have been updated from surveys – mostly aerial sample counts - conducted in 1996 or 1997 (Mackie, 1997b; Gibson, 1997; MET, 1997).

Cross-border movements

Some of the elephant populations found in Zimbabwe move between Zimbabwe and Zambia in the north. The population along the Botswana border in the west is part of a much larger population inhabiting Zimbabwe, Botswana, Namibia (Craig, 1996) and perhaps Angola. There is also possible movement between Zimbabwe, Mozambique and South Africa.

Issues

Zimbabwe harbours a large proportion of the elephants in Africa. While it is difficult to determine trends, Zimbabwe does appear to have a growing population (MET, 1997). Although elephant populations remain healthy, there has been a downward trend over the past ten years in funding available to the DNPWLM as a result of government imposed cutbacks, in conjunction with the International Monetary Fund economic structural adjustment programme (MET, 1997). However, since 1996 the DNPWLM has made an agreement with the Government of Zimbabwe to retain a portion of their revenues (East, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Zimbabwe

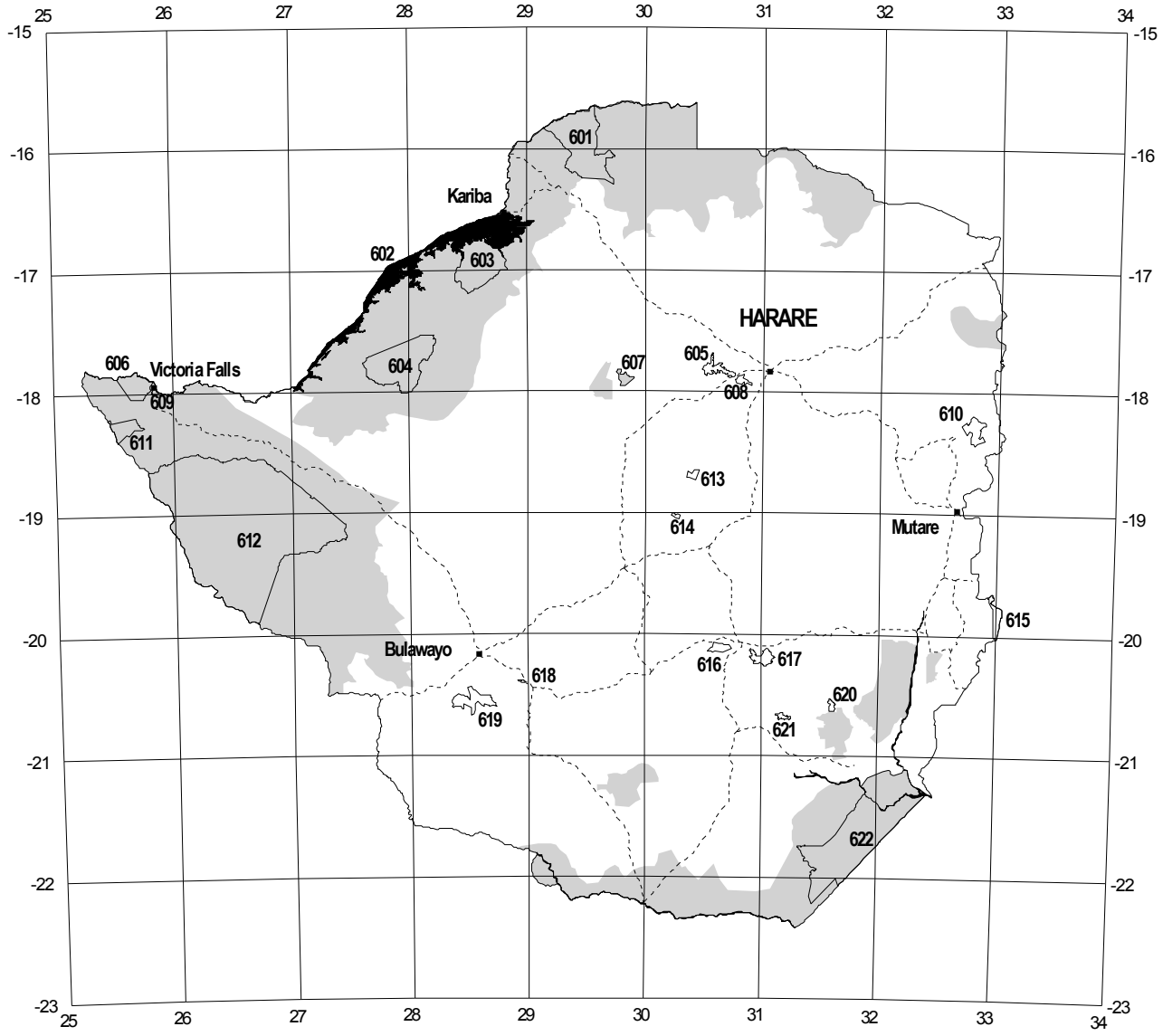
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Matusadona National Park	1997	1,392	2,206	161	1.58	Mackie, 1997b	AS2	B
102	Chizarira National Park	1997	2,084	3,626	762	1.74	Mackie, 1997b	AS1	B
201	Dande (including Dande SA)	1995	3,822	2,107	508	0.55	Mackie, 1995; DNPWLM, 1996a	AS2	B
202	Zambezi Valley Communal Lands	1995	658	338	259	0.51	DNPWLM, 1996a	AS2	B
203	Doma Safari Area	1995	945	200		0.21	DNPWLM, 1996a	IG3	D
204	Mavuradonha Wilderness Area and Great Dyke State Land	1997	617	120	120	0.19	Mackie, 1997b	AS1	B
205	Kariba Communal Lands	1997	3,220	2,293	541	0.71	Mackie, 1997b	AS2	B
206	Binga Communal Lands	1997	2,760	1,189	319	0.43	Mackie, 1997b	AS2	B
207	Chete Safari Area	1997	1,260	1,292	347	1.03	Mackie, 1997b	AS2	B
208	North Gokwe Communal Lands	1997	3,082	861	347	0.28	Mackie, 1997b	AS2	B
209	Sijarira Forest Area	1997	270	36	41	0.13	Mackie, 1997b	AS2	B
210	Chirisa Safari Area	1997	1,529	1,883	543	1.23	Mackie, 1997b	AS1	B
211	Hartley Safari Area	1995	445	100		0.22	DNPWLM, 1996a	IG3	D
212	Matabeleland Forest Area	1997	2,345	650	1,007	0.28	Gibson, 1997	AS3	B
213	Matabeleland Communal Lands	1997	3,110	0		0.00	Gibson, 1997	AS3	B

214	Save Valley Conservancy	1996	3,213	700		0.22	MET, 1997	IG3	D
215	Chiredzi River Conservancy	1996	895	27		0.03	MET, 1997	IG3	D
216	Bubiana Conservancy	1996	1,275	70		0.05	MET, 1997	IG3	D
217	Mahenya	1996	222	101	118	0.45	DNPWLM, 1996b	AS2	B
218	Matibi II	1996	400	33	34	0.08	DNPWLM, 1996b	AS2	B
219	Tuli Safari Area	1995	416	60		0.14	DNPWLM, 1996a	IG3	D
220	Beitbridge Communal Land	1995		60			DNPWLM, 1996a	IG3	D
221	UMP Communal Land	1995		50			DNPWLM, 1996a	IG3	D
222	Private Land	1995		750			DNPWLM, 1996a	IG3	D
223	Marirangwe Conservation Trust	1996	300	128		0.43	MET, 1997	IG3	D
224	Midlands Conservancy	1996	613	6		0.01	MET, 1997	IG3	D
301	Zambezi Valley Floor (excluding Dande SA)	1995	7,194	8,867	2,112	1.23	DNPWLM, 1996a	AS2	B
302	Zambezi Valley Escarpment	1995	3,826	6,131	1,392	1.60	DNPWLM, 1996a	AS2	B
303	Matetsi Safari Complex	1997	4,400	4,017	1,982	0.91	Gibson, 1997	AS2	B
304	Hwange National Park and Deka Safari Area	1997	15,219	31,613	6,962	2.08	Gibson, 1997	AS2	B
305	Gonarezhou National Park and Malipati Safari Area	1996	5,213	3,741	1,687	0.72	DNPWLM, 1996b	AS2	B

SUMMARY OF TOTALS FOR ZIMBABWE

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	63,070	8,034	8,034	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	2,151	0
E	Other Guesses	0	0	0	0
TOTAL		**63,070**	**8,034**	**10,185**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN ZIMBABWE



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 6,500,000

KEY TO PROTECTED AREAS

National Park
601 Mana Pools
603 Matusadona
604 Chizarira
606 Zambezi
609 Victoria Falls
610 Nyanga
611 Kazuma Pan
612 Hwange
615 Chimanimani
619 Matopos
622 Gonarezhou

Recreation Park
602 Kariba
605 Lake Manyante
607 Umfuli
608 Lake Chivero
613 Ngezi
614 Sebakwe
617 Kyle
618 Muzingwane
620 Manjirenji
621 Bangala

Sanctuary
616 Mushandike

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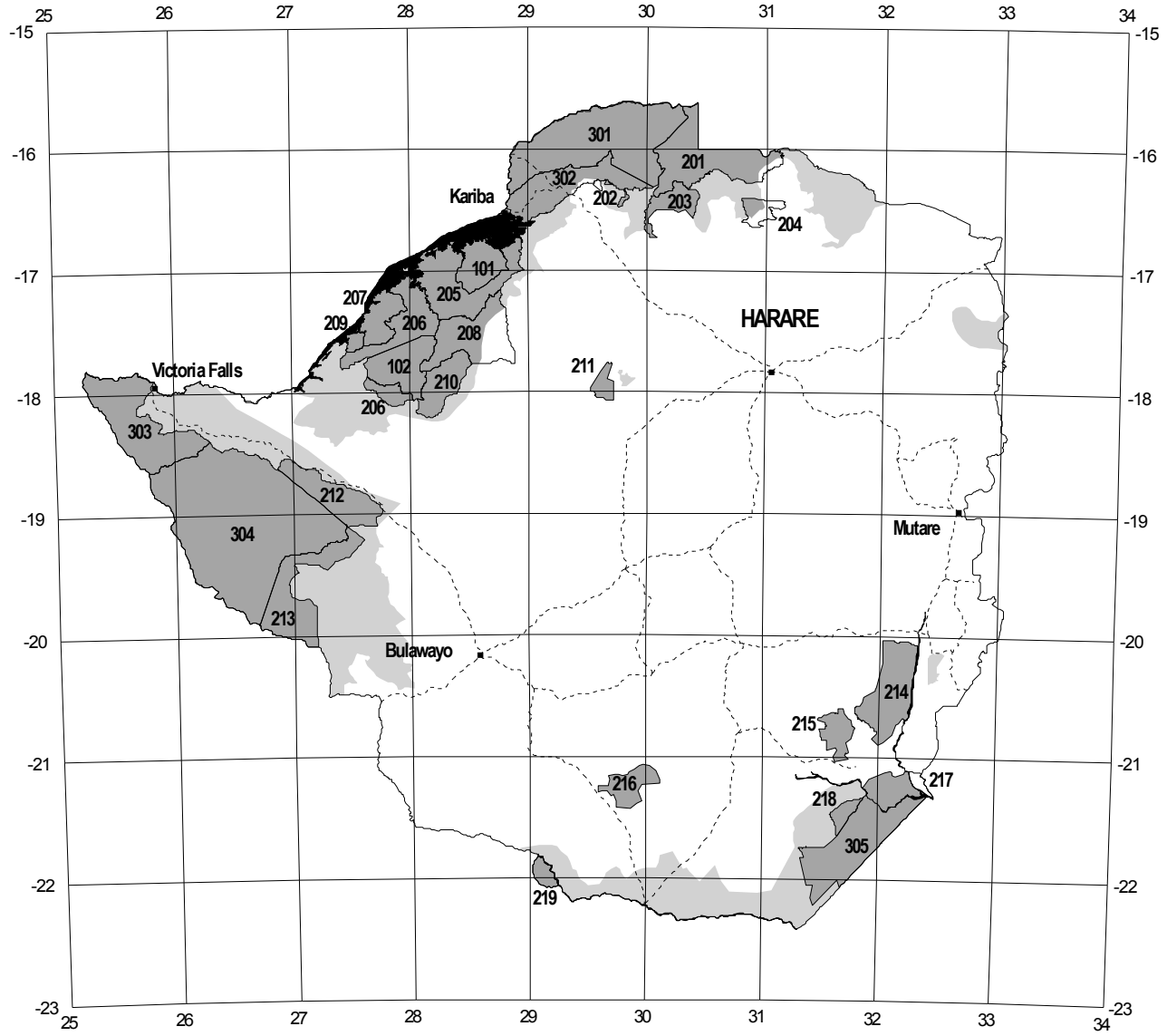
SURVEY ZONES AND ELEPHANT RANGE IN ZIMBABWE



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 6,500,000

KEY TO CODE NAMES
NP - National Park

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Matusadona NP	2206
102	Chizarira NP	3626
201	Dande	2107
202	Zambezi Valley Communal Lands	288
203	Doma Safari Area	200
204	MWA/GDSL	120
205	Kariba Communal Lands	2293
206	Binga Communal Lands	1189
207	Chete Safari Area	1292
208	North Gokwe Communal Lands	861
209	Sijarira Forest Area	36
210	Chirisa Safari Area	1883
211	Hartley Safari Area	100
212	Matabeleland Forest Area	650
213	Matabeleland Communal Lands	0
214	Save Valley Conservancy	700
215	Chiredzi River Conservancy	27
216	Bubiana Conservancy	70
217	Mahenya	101
218	Matibi II	33
219	Tuli Safari Area	60
301	Zambezi Valley Floor	10710
302	Zambezi Valley Escarpment	6131
303	Matetsi Safari Complex	4017
304	Hwange NP and Deka Safari Area	31613
305	Gonarezhou NP and Malipati Safari Area	3741

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WEST AFRICA

WEST AFRICA

West Africa has the smallest area of elephant range of the four regions, supporting only 4% of all remaining range in Africa (Figure 2). The distribution of elephant populations is highly fragmented, with small, isolated populations scattered throughout the region in both forest and savanna habitats. Many populations are shared between countries. The region has not been well surveyed and so the majority of elephant estimates have been placed in the **Possible** and **Speculative** categories (Figure 9).

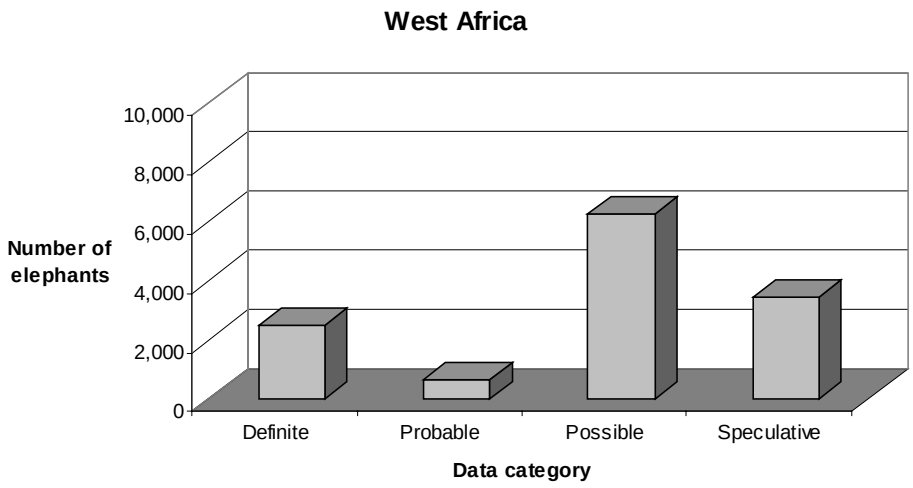


Figure 9. Elephant estimates by category for West Africa.

Civil strife has affected three countries in West Africa since the last AED update - Guinea Bissau, Liberia and Sierra Leone. This has made it difficult to conduct any elephant conservation activities, particularly survey work. No new survey results or estimates are available for any of these countries, nor is information available about elephant range.

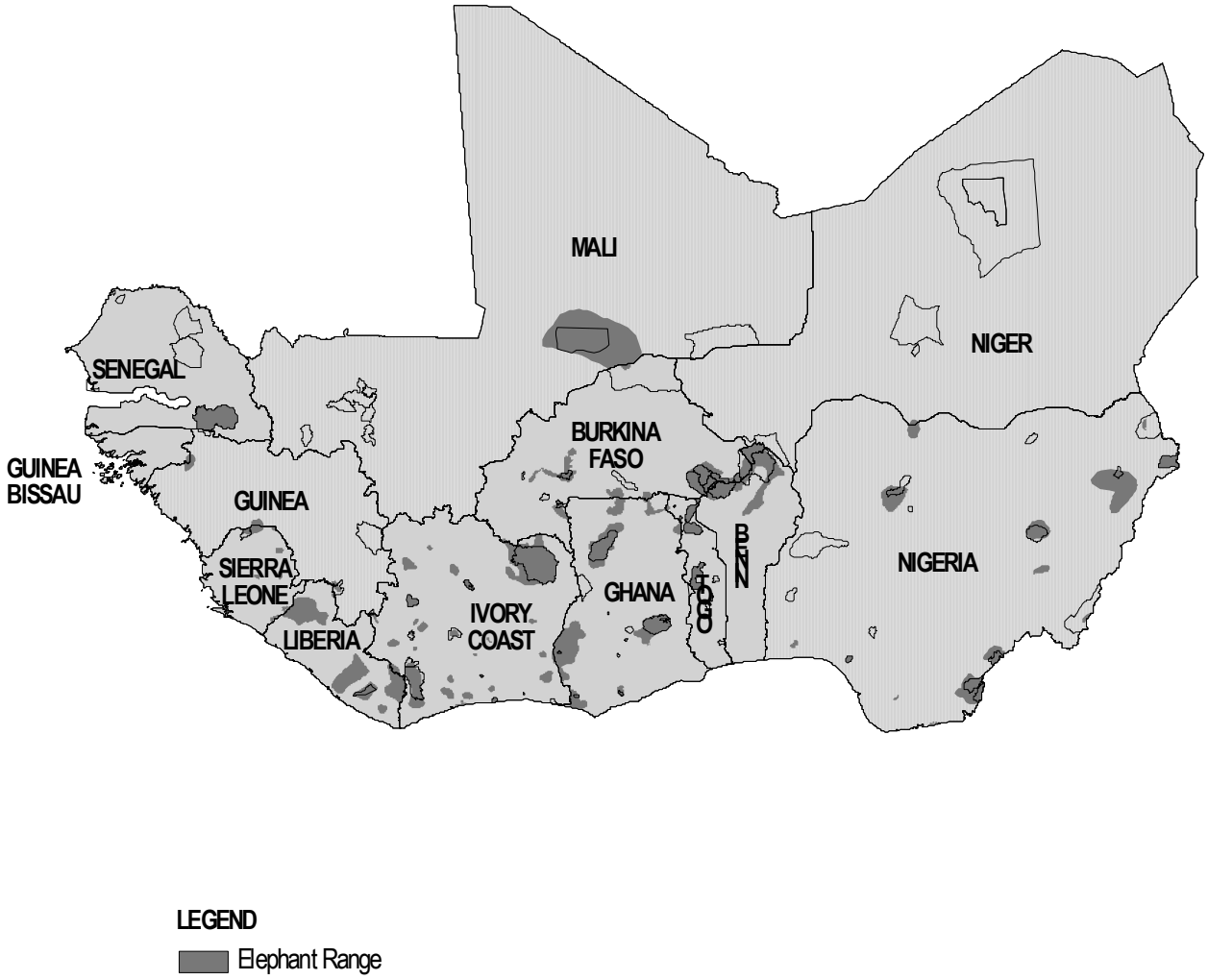
There have been no recent reports of large-scale poaching of elephants. However, there is no information from countries experiencing civil war where elephants are probably being affected by poaching. There are reports of ivory originating in Central Africa being marketed and sold in West Africa.

In this edition of the AED, West Africa has a total of 75 survey zones, 31 of which have had population estimates between 1995 and 1998. Only 14 of the 75 zones have been surveyed, by either dung counts or aerial counts, but in the remaining survey zones the elephant populations have been estimated from guesses.

SUMMARY OF ELEPHANT ESTIMATES IN WEST AFRICA

REGION	COUNTRY	NUMBER OF ELEPHANTS				TOTAL AREA (km^2)	RANGE AREA (km^2)
		DEFINITE	PROBABLE	POSSIBLE	SPECULATIVE		
WEST AFRICA	Benin	0	0	400	0	112,620	13,036
	Bukina Faso	1,616	606	1,486	0	274,200	18,198
	Ghana	476	218	1,185	443	238,540	30,202
	Guinea	0	0	108	140	245,860	2,277
	Guinea Bissau	0	0	0	35	36,120	331
	Ivory Coast	51	0	495	645	322,460	35,543
	Liberia	0	0	0	1,783	111,370	22,003
	Mali	0	0	950	50	1,240,000	37,024
	Níger	0	0	817	100	1,267,00	2,694
	Nigeria	157	0	860	236	923,770	34,383
	Senegal	9	0	11	10	196,190	8,428
	Sierra Leone	0	0	0	0	71,740	2,914
	Togo	0	0	96	0	56,790	5,430
TOTAL		**2,489**	**644**	**6,228**	**3,442**	**5,096,660**	**212,463**

PROTECTED AREAS AND ELEPHANT RANGE IN WEST AFRICA



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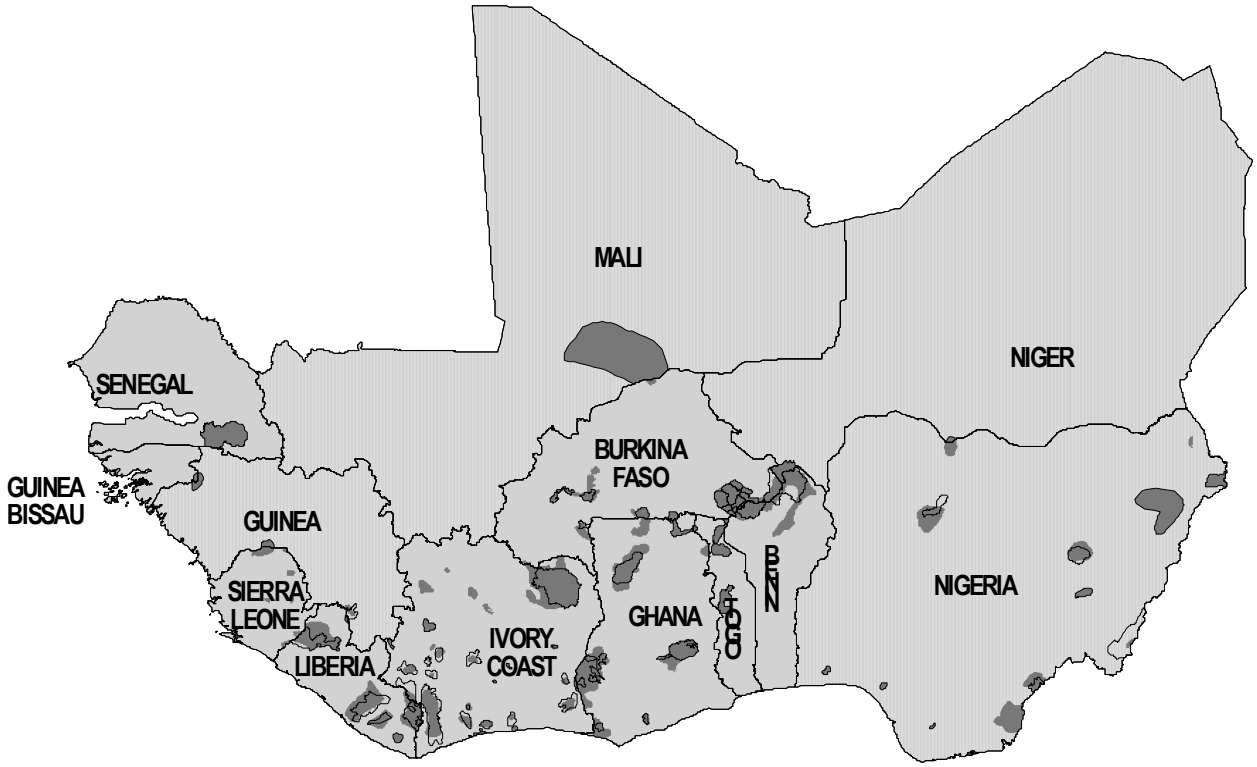
SURVEY ZONES AND ELEPHANT RANGE IN WEST AFRICA



LEGEND

Elephant Range

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BENIN

General Statistics

Country area:	112,620km^2
Range area (% of country):	13,036km^2 (12%)
Protected area coverage (% of country):	8%
Protected range (% of range in protected areas):	55%

Range

The extent of elephant range in Benin has decreased since the last AED update (Bossou, questionnaire reply, 1998), with the removal of Oueme, Trois Rivières Forest Reserve and Mont Koffe from the range map. The elephants have moved from Oueme and Trois Rivières Forest Reserve into Park W due to agricultural pressure while those from Mont Koffe moved either to Pendjari or Parc de la Keran in Togo, for unknown reasons (Sebogo, pers. comm., 1998). The narrow range south of Park W has been retained on the map because elephants are known to migrate out of Park W into both the Zone Cynegetique d'Atikora and Djona.

It is noteworthy that the only areas in Benin with a permanent elephant presence are Park W and Pendjari.

Surveys and data

A survey covering Park W and Boucle de Pendjari was carried out during 1998 (Bossou, questionnaire reply, 1998). The elephant estimates were made by following elephant tracks and noting the actual number of elephants seen. No survey report was available so the estimates are categorised as informed guesses.

Tehou (1997) studied the elephants in the Zone de Cynegetique, south of Pendjari. He estimated that there were 96 elephants, or 0.08 elephants per km^2. However, he is not sure whether they constitute part of the Pendjari elephant population and believes that only long-term monitoring will resolve this question.

Cross-border movements

Benin's elephants are found close to the northern borders where they probably move into Burkina Faso, Togo and possibly Niger, though information is lacking.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

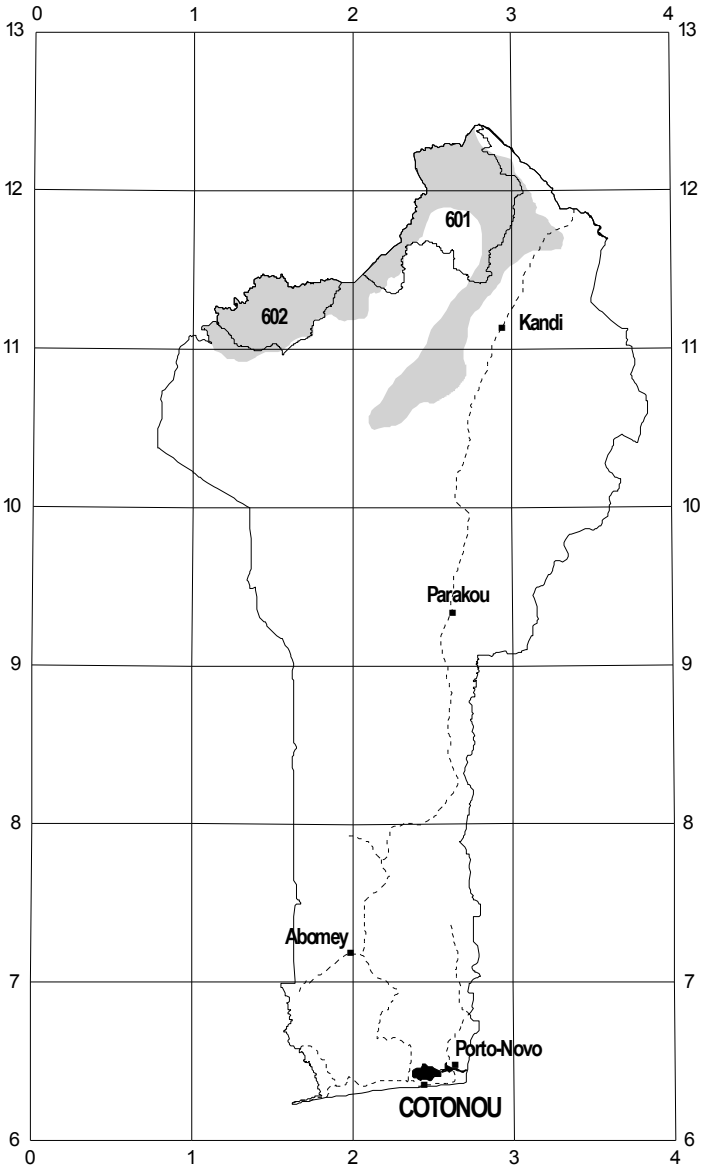
Benin

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	W du Benin National Park	1998	5,020	250		0.05	Bossou, quest. reply, 1998	IG3	D
102	Boucle de la Pendjari National Park	1998	2,755	150		0.05	Bossou, quest. reply, 1998	IG3	D

SUMMARY OF TOTALS FOR BENIN

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	400	0
E	Other Guesses	0	0	0	0
TOTAL		**0**	**0**	**400**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN BENIN



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 W du Benin
602 Boucle de la Pendjari

N

Scale 1 : 5,500,000

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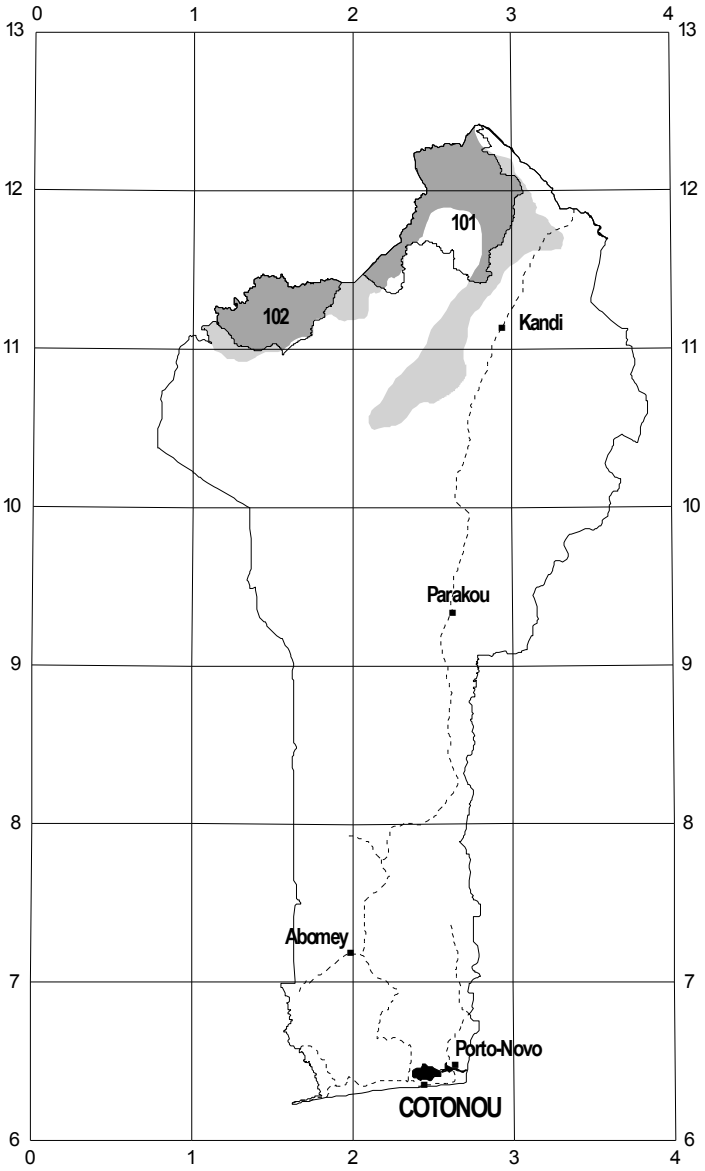
SURVEY ZONES AND ELEPHANT RANGE IN BENIN



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 5,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	W du Benin National Park	250
102	Boucle de la Pendjari National Park	150

N

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BURKINA FASO

General Statistics

Country area:	274,200km^2
Range area (% of country):	18,198km^2 (7%)
Protected area coverage (% of country):	11%
Protected range (% of range in protected areas):	55%

Range

Information on range has been updated by Chardonnet and Koalo (questionnaire reply, 1998). New range has been added between Park W and Koutiargou Partial Faunal Reserve to form one continuous strip, and to Pagou Tangougou Hunting Zone on the northwest side of Arly National Park. The range around Nazinga Game Ranch in the Tisse Classified Forest has also been expanded. The additions are based on improved information coming from the field rather than immigration of elephants into the stated areas. Range has also been added to the area southwest of Kabore-Tambi National Park because elephants are now moving across the border from Ghana (Chardonnet, pers. comm., 1998). Several areas of former range were reduced or removed because of the improved availability of food and water, reducing the need for elephant populations to travel far afield (Chardonnet, pers. comm., 1998; Chardonnet and Koalo, questionnaire reply 1998). These include the areas around Deux Bale Classified Forest and Bontioli Faunal Reserve, which were reduced, and the range areas of Mare aux Hippopotames Classified Forest and northwest of Tiogo Classified Forest, which were removed from the map.

Surveys and data

All major elephant survey zones in Burkina Faso have been updated from either new surveys or informed guesses. Singou Partial Faunal Reserve, Arly National Park, Konkombouri, Pama Centre Sud and Pagou-Tandougou were surveyed using aerial sample counts (Barry and Chardonnet, 1998). Nazinga Game Ranch was surveyed on foot by Nganga (1998), and the estimates for the remaining areas, which include W and Kourtiagou, the remainder of the Parma area, Bontioli Partial and Total Faunal Reserve, Ougarou, and the Maro and Tui Classified Forests, were all made from informed guesses based on sightings of dung or other elephant signs and extrapolations (Chardonnet and Koalo, questionnaire reply, 1998). The new survey zones for the country are Kourtiagou, Pagou -Tandougou and Zabre.

Cross-border movements

Elephants are thought to migrate from Nazinga Game Ranch into northern Ghana and Togo in the wet season (Jachmann, 1992; Chardonnet and Koalo, questionnaire reply, 1998; Barry and Chardonnet, 1998, Okoumassou *et al*., 1998), from Ghana into Zabre (Chardonnet and Koalo, questionnaire reply, 1998), from Mali into northern Burkina Faso (Chardonnet and Koalo, questionnaire reply, 1998; Barry and Chardonnet, 1998), and sometimes from Ivory Coast into the Diefoula Classified Forest in southwestern Burkina Faso (Chardonnet and Koalo, questionnaire reply, 1998).

Issues

Burkina Faso contains some of the most important remaining savanna woodlands in West Africa (East, 1996). Furthermore, it has more elephants than any other West African range state.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

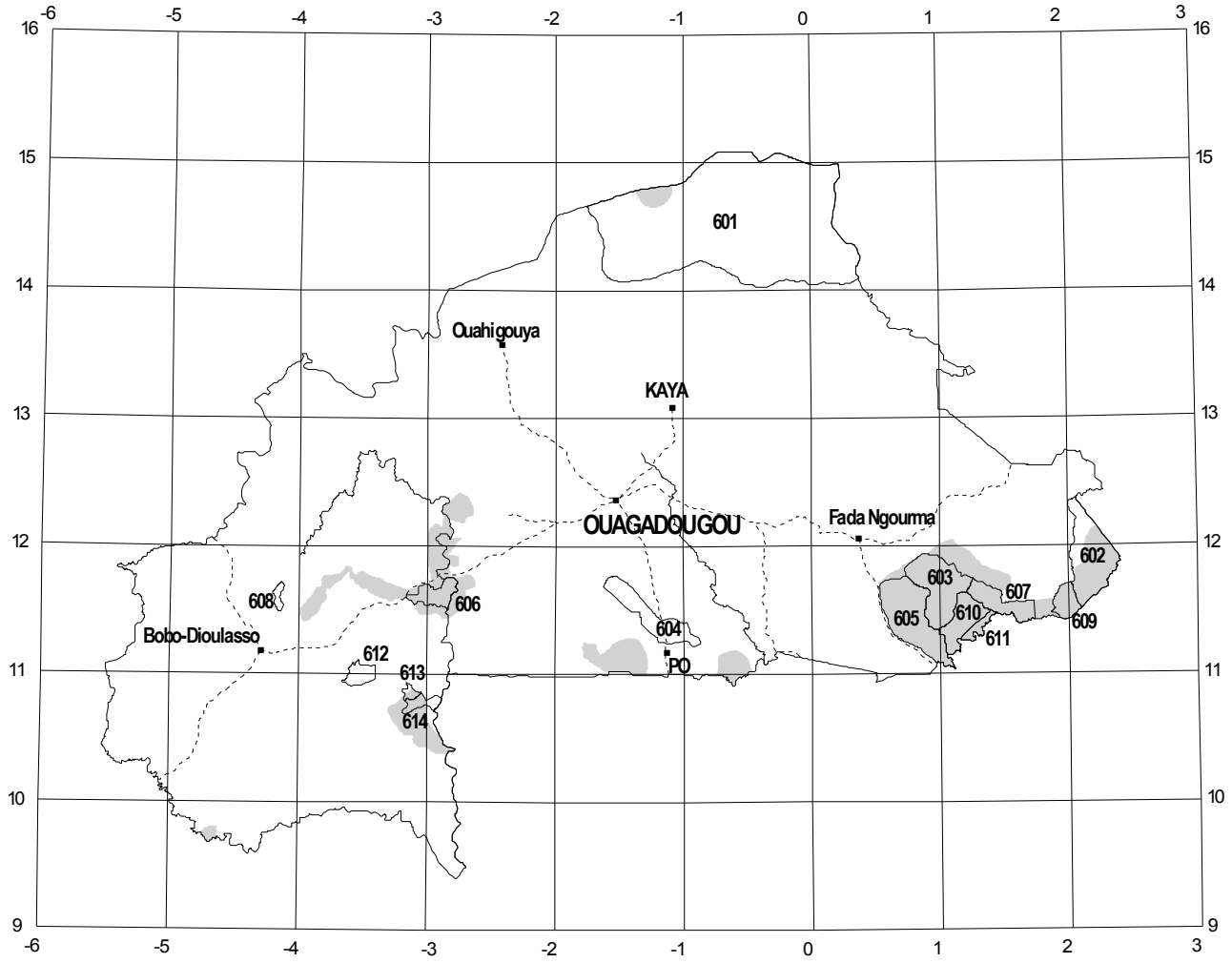
Burkina Faso

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	W National Park & Kourtiagou Partial Faunal Reserve	1998	2,878	100		0.03	Chardonnet and Koalo, quest. reply, 1998	IG3	D
102	Singou Partial Faunal Reserve	1998	1,518	434	385	0.29	Barry and Chardonnet, 1998	AS2	B
103	Remainder of Pama	1998	2,237	200		0.09	Chardonnet and Koalo, quest. reply, 1998	IG3	D
104	Arli National Park	1998	930	419	346	0.45	Barry and Chardonnet, 1998	AS2	B
105	Konkombouri	1998	650	219	192	0.34	Barry and Chardonnet, 1998	AS2	B
106	Pama Centre Sud	1998	517	270	162	0.52	Barry and Chardonnet, 1998	AS2	B
107	Bontioli Partial and Total Faunal Reserve	1998	420	50		0.12	Chardonnet and Koalo, quest. reply, 1998	IG3	D
201	Ougarou	1998	644	100		0.16	Chardonnet and Koalo, quest. reply, 1998	IG3	D
202	Pagou-Tandougou	1998	300	391	171	1.30	Barry and Chardonnet, 1998	AS2	B
203	Maro and Tui Classified Forest	1998	930	80		0.09	Chardonnet and Koalo, quest. reply, 1998	IG3	D
204	Nazinga Game Ranch	1998	940	489	86	0.52	Nganga, 1998	GS3	B
205	Zabré	1998	600	150		0.25	Chardonnet and Koalo, quest. reply, 1998	IG3	D
301	Deux Bale and Dibon Classified Forest	1998	838	200		0.24	Chardonnet and Koalo, quest. reply, 1998	IG3	D

SUMMARY OF TOTALS FOR BURKINA FASO

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	1,616	606	606	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	880	0
E	Other Guesses	0	0	0	0
TOTAL		**1,616**	**606**	**1,486**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN BURKINA FASO



LEGEND

- Town
- Road
- River
- Lake
- 601 Protected Area
- Elephant Range

Scale 1 : 6,500,000

KEY TO PROTECTED AREAS

National Park
602 W du Burkina Faso
604 Kabore-Tambi
607 Arly

Total Faunal Reserve
611 Madjoari
613 Bontioli

Partial Faunal Reserve
601 Sahel

603 Singou
605 Pama
609 Kourtiagou
610 Arly
612 Nabere
614 Bontioli

Classified Forest
606 Deux Bale
608 Mare aux Hippopotames

N

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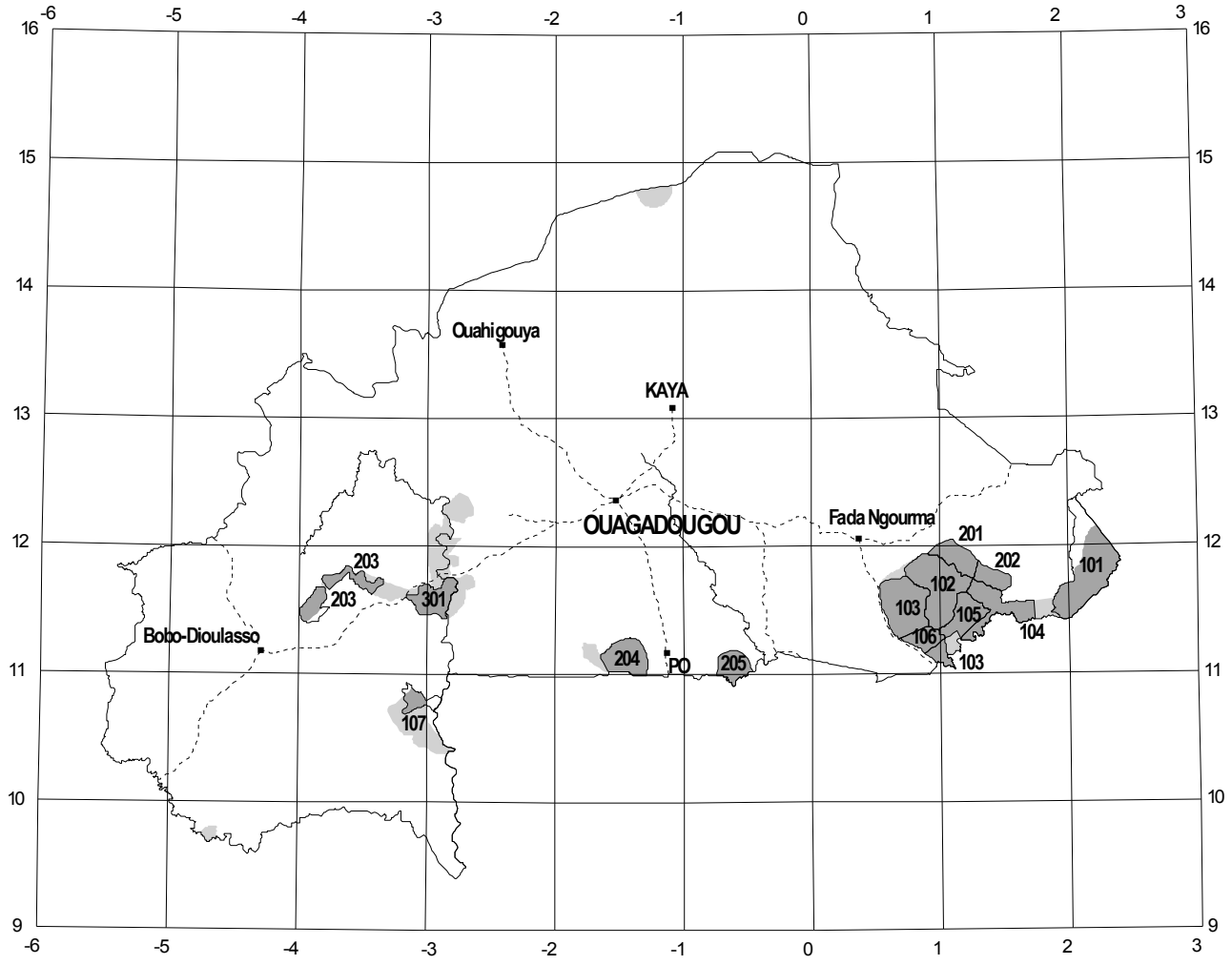
SURVEY ZONES AND ELEPHANT RANGE IN BURKINA FASO



LEGEND

- Town
- Road
- River
- Lake
- 101 Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 6,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	W NP and Kourtiagou PFR	100
102	Singou PFR	434
103	Remainder of Pama	200
104	Arly NP	419
105	Konkombouri	219
106	Pama Centre Sud	270
107	Bontioli FR	50
201	Ougarou	100
202	Pagou-Tandougou	391
203	Maro and Tui CF	80
204	Nazinga GR	489
205	Zabré	150
301	Deux Bale and Dibon CF	200

KEY TO ZONE NAMES

CF	Classified Forest
NP	National Park
GR	Game Ranch
PFR	Partial Faunal Reserve
FR	Forest Reserve

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GHANA

General Statistics

Country area:	238,540km^2
Range area (% of country):	30,202km^2 (13%)
Protected area coverage (% of country):	5%
Protected range (% of range in protected areas):	28%

Range

The elephant range for Ghana has been updated only in the northeast, to reflect the migratory corridor linking Burkina Faso and Togo (Sam, questionnaire reply, 1998; Okoumassou *et al*., 1998).

Surveys and data

No new surveys or population estimates are available for Ghana. Survey zones missing in the last report are, however, now shown in this edition. These zones include western Ghana, Chichibon Corridor and northeastern Ghana.

Cross-border movements

Ghana shares several elephant populations with neighbouring countries. Elephants move between Ghana and Burkina Faso (Chardonnet and Koalo, questionnaire reply, 1998), across the eastern border with Togo (Okoumassou *et al*., 1998), and possibly the western border with Ivory Coast. The corridor between Togo and Ghana is protected by forest reserves in Ghana, but is under serious threat from expanding agriculture on the Togolese side (Sam *et al.*, 1998).

Issues

Ghana has a high human density which has resulted in the elimination or reduction of most elephant populations. Crop-raiding by elephants is a serious problem in many areas of remaining elephant range (Barnes *et al*., 1995b; Sam *et al*., 1997; Sam *et al*., 1998).

As only Mole and Kakum National Parks have been surveyed, there is an urgent need to undertake survey work to determine the status of elephants in both the savanna and forest zones.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Ghana

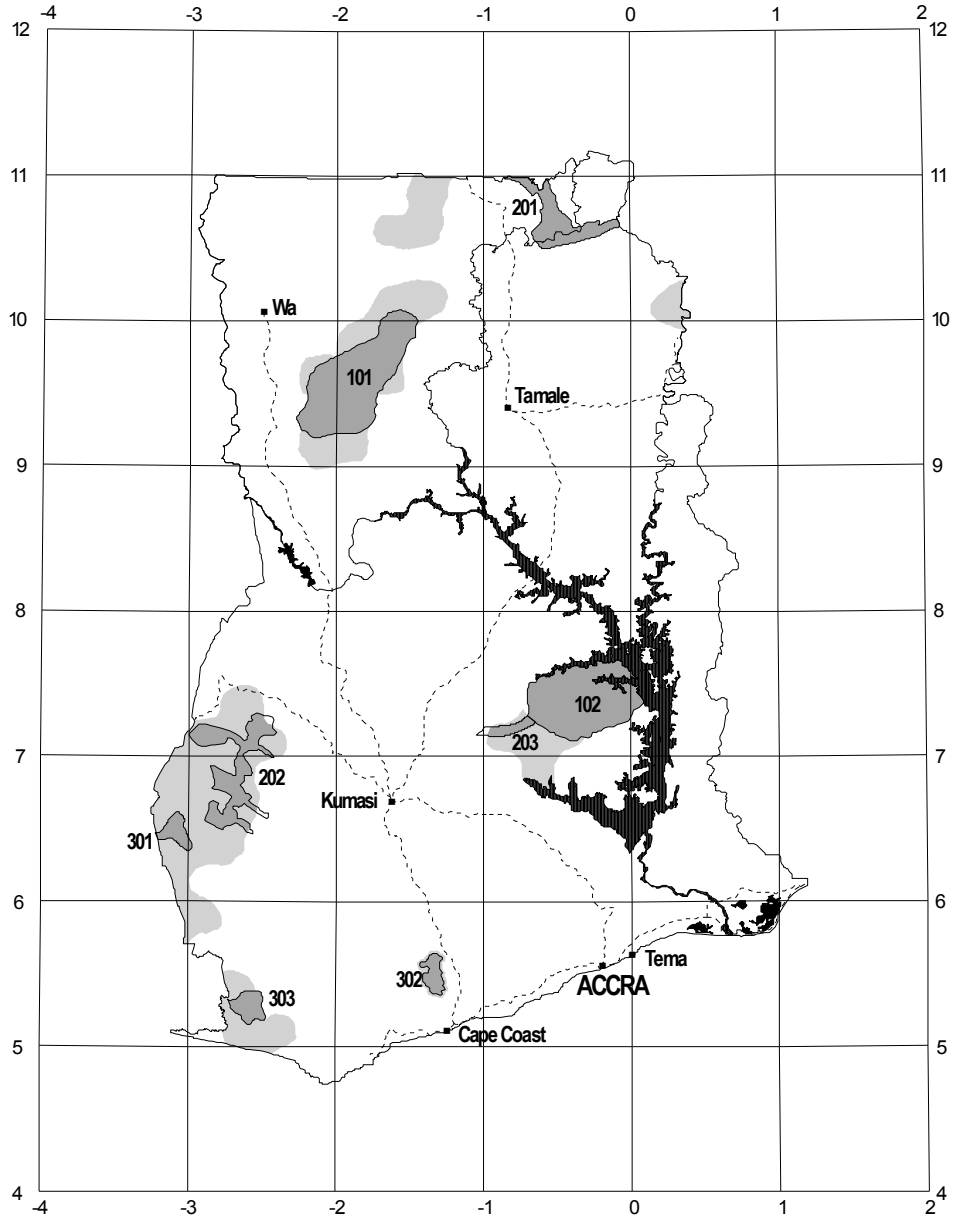
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Mole National Park	1993	4,840	589	218	0.12	Grainger, pers. comm., 1994	AS3	B
102	Digya National Park	1994	3,478	200		0.06	Sam, 1994a	IG3	D
201	Northeastern Ghana	1996	1,370	100	50*	0.07	Sam, 1994b	IG3	D
202	Western Ghana	1994	2,035	500	300*	0.25	Sam, pers. comm., 1995	IG3	D
203	Chichibon Corridor	1994	290	12	3*	0.04	Sam and Wilson, 1994	IG3	D
301	Bia National Park and Resource Reserve	1994	306	100		0.33	Sam, pers. comm., 1995	IG3	D
302	Kakum National Park & Assin-Attandanso Resource Reserve	1990	347	100		0.29	Dudley *et al*., 1992	IG3	D
303	Nini-Suhein National Park and Ankasa Resource Reserve	1994	509	60	90*	0.12	Sam, pers. comm., 1995	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR GHANA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	371	218	218	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	105	0	967	443
E	Other Guesses	0	0	0	0
TOTAL		**476**	**218**	**1,185**	**443**

SURVEY ZONES AND ELEPHANT RANGE IN GHANA



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 6,000,000

KEY TO ZONE NAMES

NP - National Park
RR - Resource Reserve

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Mole NP	589
102	Digya NP	200
201	Northeastern Ghana	100
202	Western Ghana	500
203	Chichibon Corridor	12
301	Bia NP and RR	100
302	Kakum NP and Assin-Attandanso RR	100
303	Nini-Suhien NP and Ankasa RR	60

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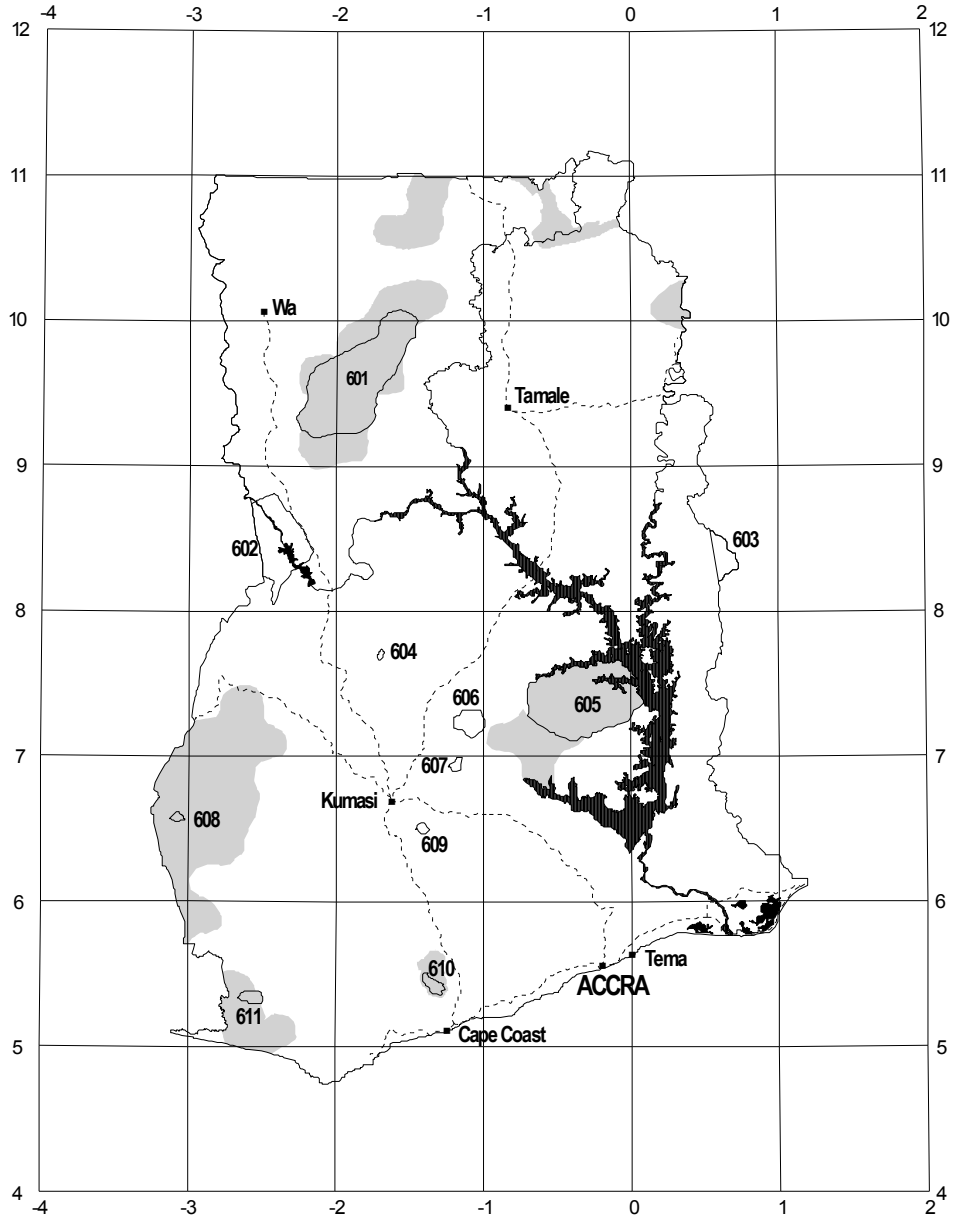
PROTECTED AREAS AND ELEPHANT RANGE IN GHANA



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 6,000,000

KEY TO PROTECTED AREAS

National Park
601 Mole
602 Bui
603 Kyabobo Range
605 Digya
608 Bia
610 Kakum
611 Nini-Suhien

Strict Nature Reserve
606 Kogyae

Wildlife Sanctuary
604 Boabeng-Fiema
607 Bomfobiri
609 Owabi

N

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GUINEA

General Statistics

Country area:	245,860km^2
Range area (% of country):	2,277km^2 (1%)
Protected area coverage (% of country):	3%
Protected range (% of range in protected areas):	14%

Range

Old range estimates placed elephants in 12 scattered locations, and were based on historical knowledge of elephants in these ranges (eg. Douglas-Hamilton *et al.*, 1992; Said *et al.*, 1995). However, a report from Guinea's Ministère de l'Agriculture des Eaux et Forets (1998) indicates that now there are only three ranges in Guinea: a small one in the southeast around the Ziama Forest Reserve; another in the centre of the country on the border with Sierra Leone; and a third in the northwest on the border with Guinea Bissau – all with significant elephant activity. There are no longer any elephants in the range that straddled the border with Mali (Niagate, questionnaire reply, 1998).

Surveys and data

A joint World Bank and German Government project has been monitoring elephant populations since 1997 in the Ziama Forest Reserve (DNFF and KfW, 1997). The sizes of the other two populations have been estimated by Sagnah (questionnaire reply, 1998). These are the first estimates since Macky (1991) and Roth and Douglas Hamilton (1991). The AED 1995 update estimated 1,000 elephants. However, the new estimates place 108 elephants in the **Possible** category and 140 in the **Speculative** category.

Cross-border movements

There is a possibility that Guinea shares its elephant populations with Sierra Leone and Senegal, but information is lacking.

Issues

Guinea has approximately 200 protected areas of all categories. The newest areas gazetted in 1997 are the Haut Niger National Park and Haute Guinée Park, covering a total area of about 54,000ha (Sagnah, questionnaire reply, 1998).

The only remaining viable elephant population is in Ziama (DNFF and KfW, 1997). There is an indication that this population is increasing and elephants are now moving outside Ziama, as the government is receiving reports from villages of elephant visitations for the first time (DNFF and KfW, 1997).

Three of Guinea's neighbours (Liberia, Sierra Leone and Guinea Bissau) have suffered civil conflict within the past three years. An influx of refugees from the civil war in Liberia has affected Ziama (Sagnah, questionnaire reply, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELAIBILITY is keyed from A (best) to E (worst)

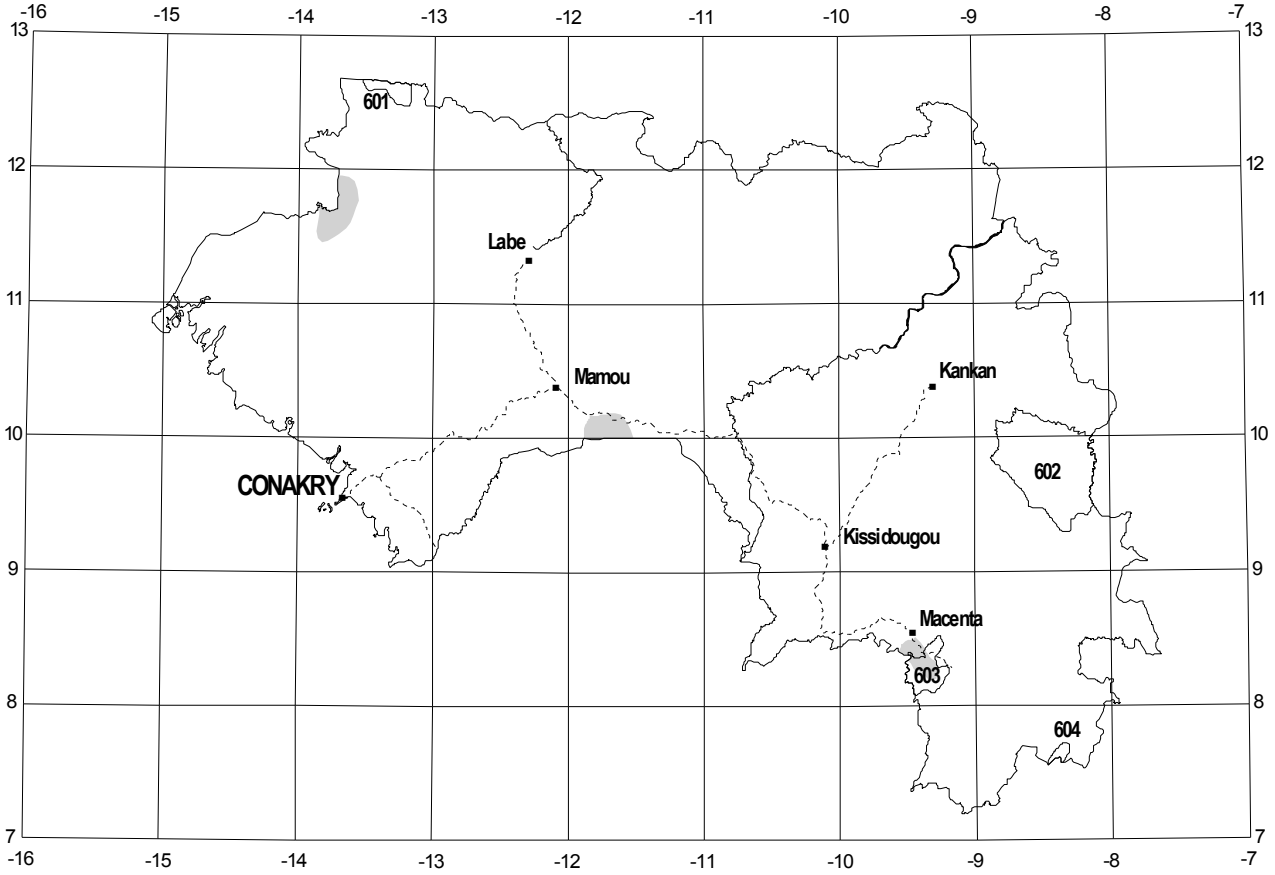
Guinea

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Massif du Ziama Strict Nature Reserve	1997	1,123	108		0.10	DNFF and KfW, 1997	DC3	D
201	Remaining Areas	1998	1,710	140		0.08	Sagnah, quest. reply, 1998	OG3	E

SUMMARY OF TOTALS FOR GUINEA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	108	0
E	Other Guesses	0	0	0	140
TOTAL		**0**	**0**	**108**	**140**

PROTECTED AREAS AND ELEPHANT RANGE IN GUINEA



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 Badiar

Strict Nature Reserve
602 Kankan
603 Massif du Ziama
604 Mont Nimba

N

Scale 1 : 6,500,000

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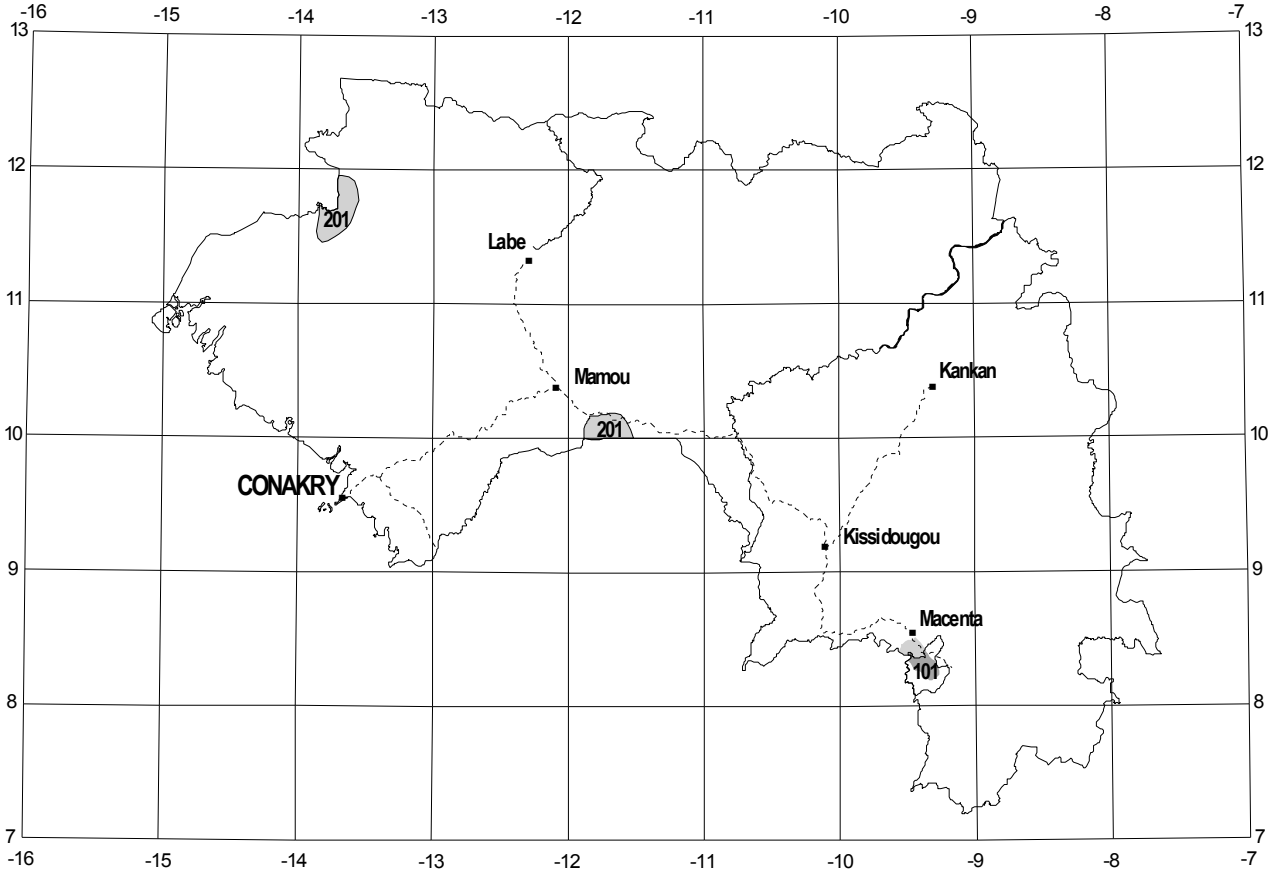
SURVEY ZONES AND ELEPHANT RANGE IN GUINEA



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 6,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Massif du Ziama Strict Nature Reserve	108
201	Remaining Areas	140

N

AfESG

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UNEP

GUINEA BISSAU

General Statistics

Country area:	36,120km^2
Range area (% of country):	331km^2 (1%)
Protected area coverage (% of country):	0%
Protected range (% of range in protected areas):	0%
Range with surveys or population estimates (% of country):	100%

Range

The range estimate is based on the survey by Limoges (1989) which revealed one small area of range in the east that contained a small number of elephants. No new range information has been made available since then.

Surveys and data

There has been no recent information on elephants from Guinea Bissau and the existing data are poor. An inventory of all the fauna in Guinea Bissau was made in 1989 (Limoges, 1989). During this exercise, no elephants were seen but some old tracks and dung were noted in the southeast area adjacent to Guinea. A dung count based on a small number of transects gave an estimate of only five elephants, and the report recommended the creation of a protected area to ensure the survival of the African elephant in Guinea Bissau. The last estimate for the area was made by Sournia (1992) who provided a rough estimate of 35.

Cross-border movements

There is no information on cross-border movements.

Issues

The recent outbreak of civil war in 1998 creates a tenuous situation for the remaining elephants. The war will prevent survey and/or conservation work and increase the risk of poaching.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

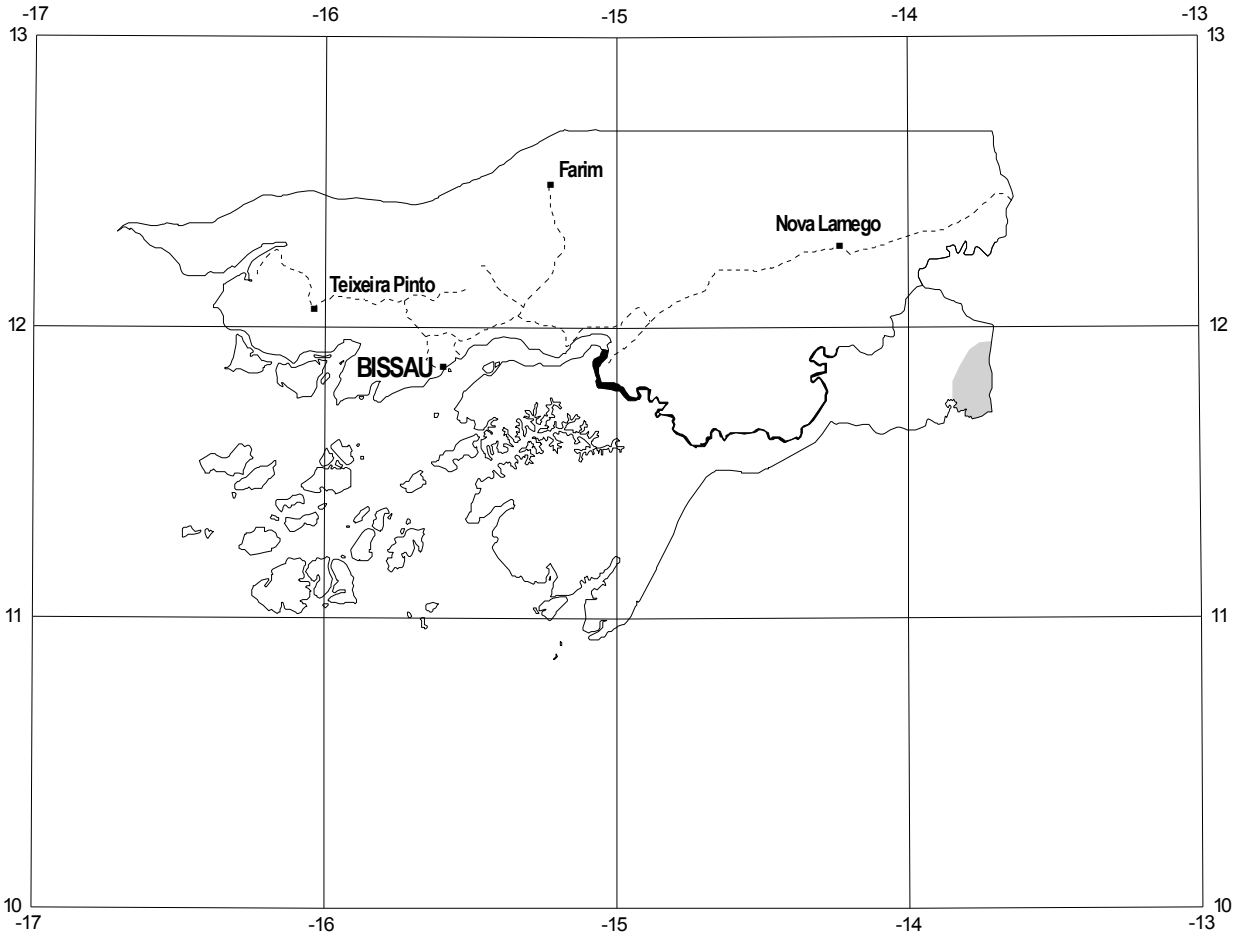
Guinea Bissau

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
201	Binasse		330	35		0.11	Sournia, in Douglas-Hamilton *et al.*, 1992	OG3	E

SUMMARY OF TOTALS FOR GUINEA BISSAU

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	35
TOTAL		**0**	**0**	**0**	**35**

PROTECTED AREAS AND ELEPHANT RANGE IN GUINEA BISSAU



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 3,000,000

KEY TO PROTECTED AREAS

There are no protected areas in Guinea Bissau

N

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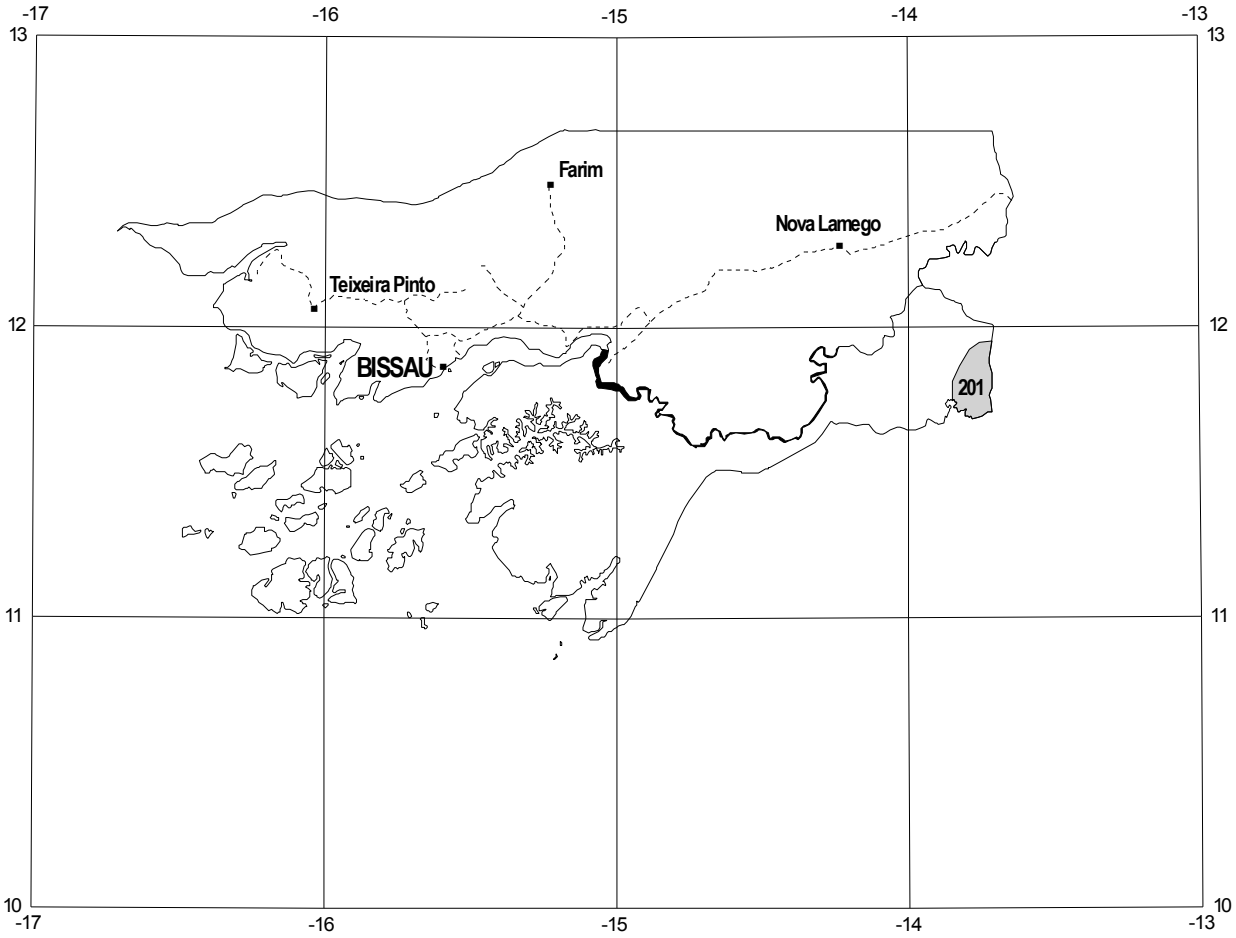
SURVEY ZONES AND ELEPHANT RANGE IN GUINEA BISSAU



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 3,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
201	Binasse	35

N

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CÔTE D'IVOIRE / IVORY COAST

General Statistics

Country area:	322,460km^2
Range area (% of country):	35,543km^2 (11%)
Protected area coverage (% of country):	6%
Protected range (% of range in protected areas):	51%

Range

Elephants are found in many small, isolated sites. Range has been estimated mostly within protected areas and there are only a few small pockets of elephants outside protected areas in south-central Ivory Coast.

Surveys and data

There are 23 different survey zones in Ivory Coast, only two of which (Tai and Comoé National Parks) have been updated with new information. Sixteen have not been updated since 1989 or before, when Merz and Hoppe-Dominik (1991) described the status of forest elephants in the country and summarised the 1988 and 1989 census estimates, which totalled 1,520. The detailed studies from Tai National Park (Merz, 1986) are already more than ten years old. Surveys are being currently carried out in Marahoue, Tai and Comoé National Parks (Hoppe-Dominik, 1998; Kouame, pers. comm., 1998; Fischer, pers. comm., 1998).

There are still very few elephants (51) in the **Definite** category, for which the estimates originate from ground total counts conducted in Abo Koamekro National Park (Kouame, questionnaire reply, 1994) and Beki-Bossematie Classified Forest (Waitkuwait, questionnaire reply, 1994). The majority of elephant numbers still remain as **Possible** or **Speculative** (425 and 795 respectively).

The recent estimates for Tai and Comoé National Parks came from ecological monitoring programmes established by Hoppe-Dominik (1998) and Fischer (pers. comm., 1998) respectively. Fischer (pers. comm., 1998) notes that in five years she has seen elephants on only three occasions, and in each case there were less than ten elephants. Furthermore, she says that elephants no longer visit communities around Comoé in search of water.

Cross-border movements

Ivory Coast, as with most West African countries, shares its elephant populations with surrounding countries. There may be cross-border movements of elephants between Ivory Coast and Burkina Faso (Chardonnet and Koalo, questionnaire reply, 1998), and from Ivory Coast into Ghana and Liberia.

Issues

Uncontrolled logging of forests in Ivory Coast has led to a great reduction of primary forest. Fairhead and Leach (1998) report that about two fifths of the country's forests remain. Logged forests have often been converted into cocoa plantations or lost to expanding subsistence agriculture, so elephants are increasingly restricted to protected areas.

Although the ivory carving industry declined after the 1990 trade ban, it remains one of the largest in the region (Dublin *et al*., 1995), and has the potential to attract ivory from illegally-killed elephants. Ivory poaching is a serious threat. Merz & Hoppe-Dominik (1991) estimated that between 1980 and 1989 the forest area occupied by elephants in Ivory Coast declined by 40% while the number of forest elephants declined by 50%. The estimate for Tai National Park has fallen from 800 (Merz, 1982, quoted in Merz & Hoppe-Dominik, 1991) to its current level of 75. Although Comoé and Tai National Parks, one a savanna park and the other a forest park, are among the largest in the region and cover a combined area of 17,900 square kilometres, between them they support less than 300 elephants.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Côte d'Ivoire

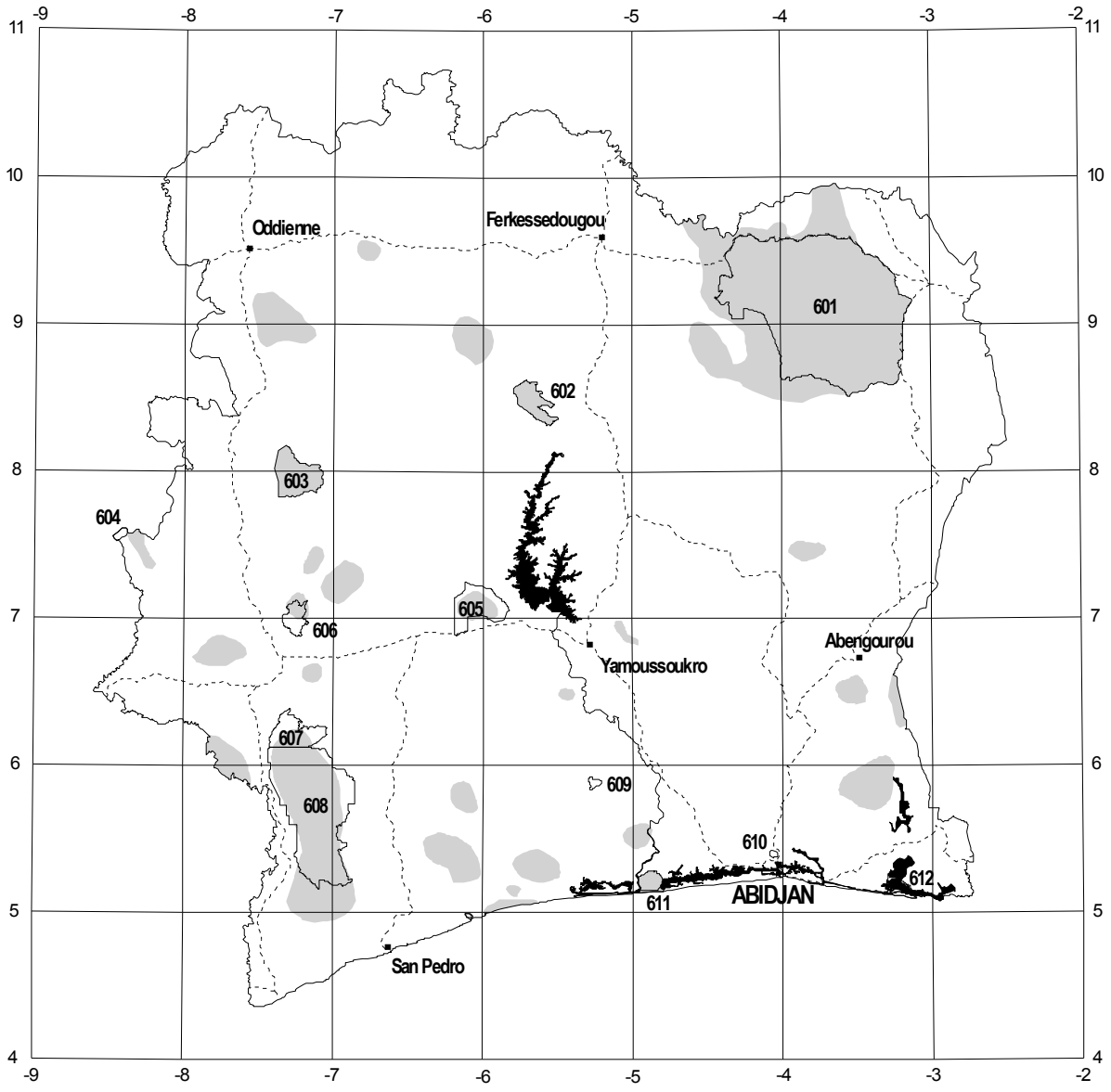
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Comoé National Park	1998	11,500	200		0.02	Fischer, pers. comm., 1998	IG3	D
102	Mont Sangbe National Park	1989	950	30		0.03	Merz and Hoppe-Dominik, 1991	OG3	E
103	Marahoué National Park	1991	1,010	70		0.05	Merz and Hoppe-Dominik,1991	IG3	D
104	Mont Peko National Park	1989	340	20		0.06	Merz and Hoppe-Dominik, 1991	OG3	E
105	Azagny National Park	1987	190	60		0.32	Lauginie, in Douglas-Hamilton et al, 1992	AS3	E
201	Tiapleu Forest	1989	380	10		0.03	Merz and Hoppe-Dominik, 1991	OG3	E
202	Keregbo Forest	1989	213	30		0.14	Merz and Hoppe-Dominik, 1991	OG3	E
203	Haut Sassandra Classified Forest	1989	1,024	50		0.05	Merz and Hoppe-Dominik, 1991	OG3	E
204	Scio Classified Forest	1989	1,338	30		0.02	Merz and Hoppe-Dominik, 1991	OG3	E
205	Abo Koamekro	1994	135	6		0.04	Kouame, quest. reply, 1994	GT1	A
206	Duekoué Forest	1989	536	15		0.03	Merz and Hoppe-Dominik, 1991	OG3	E
207	Beki-Bossematie Classified Forest	1993	389	45		0.12	Waitkuwait, quest. reply, 1994	GT1	A
208	Djambamakrou Forest	1989	274	30		0.11	Merz and Hoppe-Dominik, 1991	OG3	E
209	Goin-Cavally Classified Forest	1989	1,890	70		0.04	Merz and Hoppe-Dominik, 1991	OG3	E

210	Tene Forest	1989	4	5	1.25	Merz and Hoppe-Dominik, 1991	OG3	E
211	Songan-Tamin-Mabi-Yaya Classified Forest	1989	1,698	150	0.09	Merz and Hoppe-Dominik, 1991	OG3	E
212	Davo Forest	1989	126	20	0.16	Merz and Hoppe-Dominik, 1991	OG3	E
213	Go-Bodienou Forest	1989	600	20	0.03	Merz and Hoppe-Dominik, 1991	OG3	E
214	Niegré Classified Forest	1989	1,056	50	0.05	Merz and Hoppe-Dominik, 1991	OG3	E
215	Okromodou Forest	1989	945	50	0.05	Merz and Hoppe-Dominik, 1991	OG3	E
216	Bolo Forest	1989	88	5	0.06	Merz and Hoppe-Dominik, 1991	OG3	E
217	Fresco Forest	1991	2,229	150	0.07	Alers, in Douglas-Hamilton et al, 1992	IG3	D
301	Taï Ecosystem	1998	6,410	75	0.01	Hoppe-Dominik, 1998	IG3	D

SUMMARY OF TOTALS FOR CÔTE D'IVOIRE

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	51	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	495	0
E	Other Guesses	0	0	0	645
TOTAL		**51**	**0**	**495**	**645**

PROTECTED AREAS AND ELEPHANT RANGE IN IVORY COAST



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 5,500,000

KEY TO PROTECTED AREAS

National Park
601 Comoé
603 Mont Sangbe
605 Marahoué
606 Mont Peko
608 Taï
610 Banco
611 Azagny
612 Iles Ehotile

Strict Nature Reserve
604 Mont Nimba

Fauna and Flora Reserve
602 Haut Bandama

Partial Faunal Reserve
607 N'Zo

Botanical Reserve
609 Divo

N

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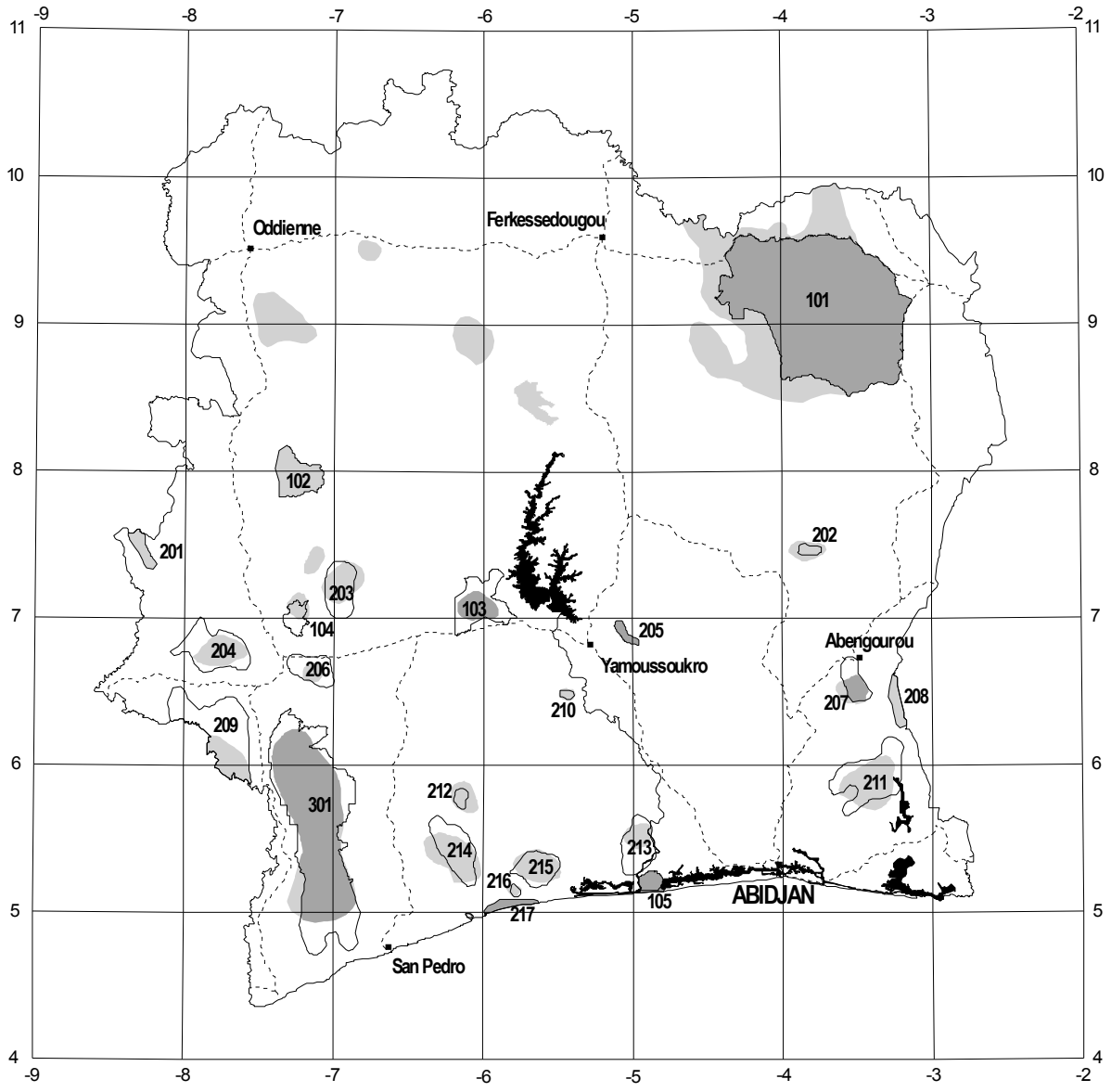
SURVEY ZONES AND ELEPHANT RANGE IN IVORY COAST



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 5,500,000

KEY TO ZONE NAMES
NP National Park
F Forest
CF Classified Forest

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE	CODE	ZONE NAME	ESTIMATE
101	Comoé NP	200	208	Djambamakrou F	30
102	Mont Sangbe NP	30	209	Goin-Cavally CF	70
103	Marahoué NP	70	210	Tene F	5
104	Mont Peko NP	20	211	Songan-Tamin-Mabi-Yaya CF	150
105	Azagny NP	60	212	Davo F	20
201	Tiapleu F	10	213	Go-Bodienou F	20
202	Keregbo F	30	214	Niegre Classified F	50
203	Haut Sassandra CF	50	215	Okromodou F	50
204	Scio CF	30	216	Bolo F	5
205	Abo Koamekro	6	217	Fresco F	150
206	Duekoue F	15	301	Taï Ecosystem	75
207	Beki-Bossematie CF	45			

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UNEP

LIBERIA

General Statistics

Country area:	111,370km^2
Range area (% of country):	22,003km^2 (20%)
Protected area coverage (% of country):	1%
Protected range (% of range inprotected areas):	4%

Range

No updates or changes have been made to the elephant range. The current range estimate originates from Anstey and Dunn (1991) and needs to be revisited now that conservation efforts are being renewed.

Surveys and data

No new survey work has been undertaken since Anstey and Dunn (1991) and all population estimates for the country are classified as other guesses. The estimate for Sapo National Park has been placed in the **Speculative** category because of the civil strife.

Cross-border movements

No information is available on cross-border movements though it is possible that elephants may move into Ivory Coast to the east and Sierra Leone to the west.

Issues

The large areas of contiguous forest in the northwest and southeast, the lower human population density compared with its neighbours, and the lower rate of deforestation (Mayers *et al.*, 1992), are all factors which give Liberia the potential to be the most important refuge for elephants in the Upper Guinea forests. Now that the war has ended, it is hoped that new surveys will be undertaken.

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

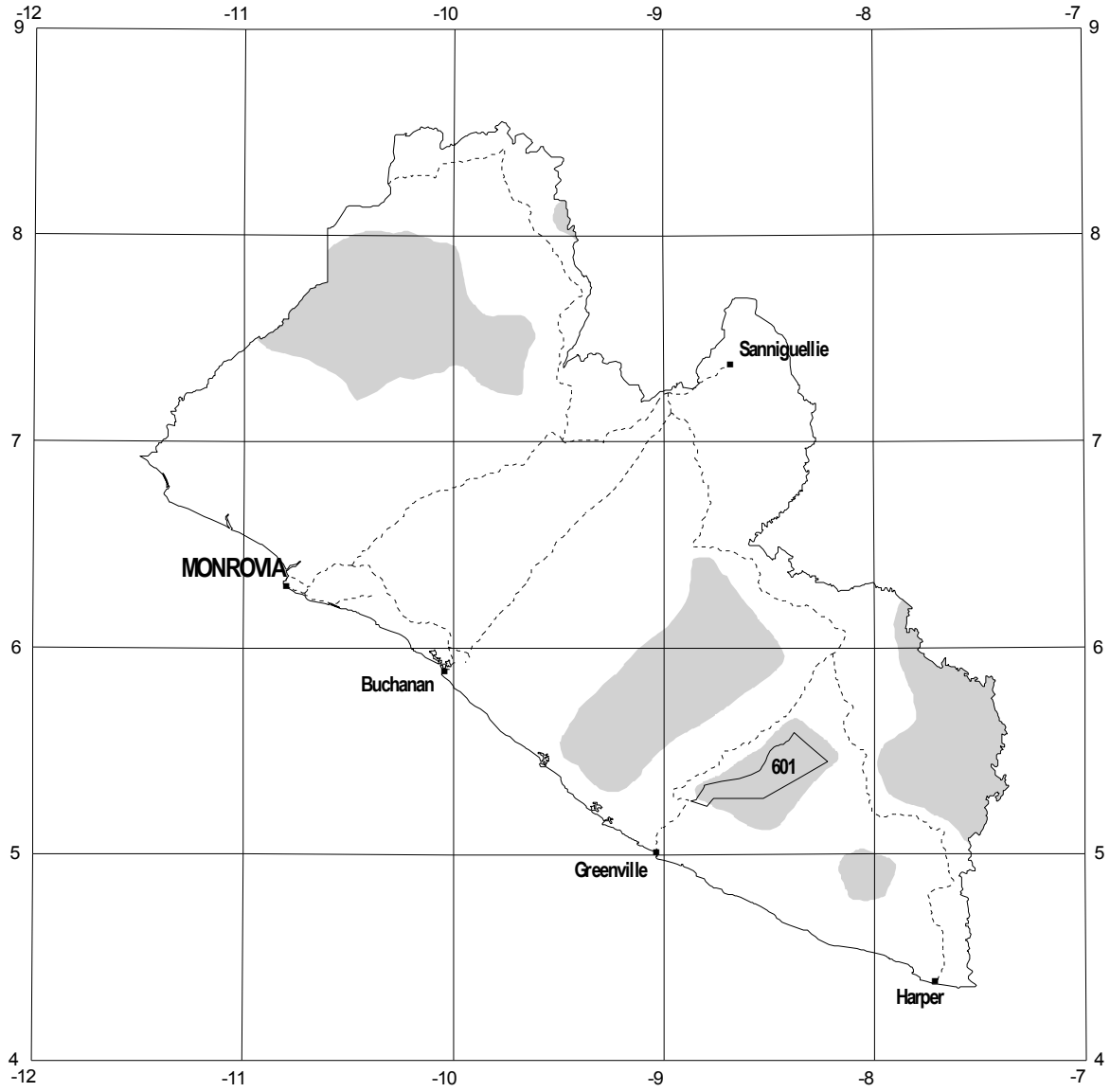
Liberia

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Sapo National Park	1990	1,292	430		0.33	Anstey and Dunn, 1991	DC3	E
201	North East National Forest	1990	130	33		0.25	Anstey and Dunn, 1991	OG3	E
202	Gola, Kpelle and Lorma National Forest	1990	4,255	495		0.12	Anstey and Dunn, 1991	OG3	E
203	Krahn Bassa National Forest	1990	5,142	495		0.10	Anstey and Dunn, 1991	OG3	E
204	Grebo National Forest	1990	2,510	231		0.09	Anstey and Dunn, 1991	OG3	E
205	Barrobo National Forest	1990	640	99		0.15	Anstey and Dunn, 1991	OG3	E

SUMMARY OF TOTALS FOR LIBERIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	0	0
E	Other Guesses	0	0	0	1,783
TOTAL		**0**	**0**	**0**	**1,783**

PROTECTED AREAS AND ELEPHANT RANGE IN LIBERIA



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 Sapo

N

Scale 1 : 4,000,000

AfESG

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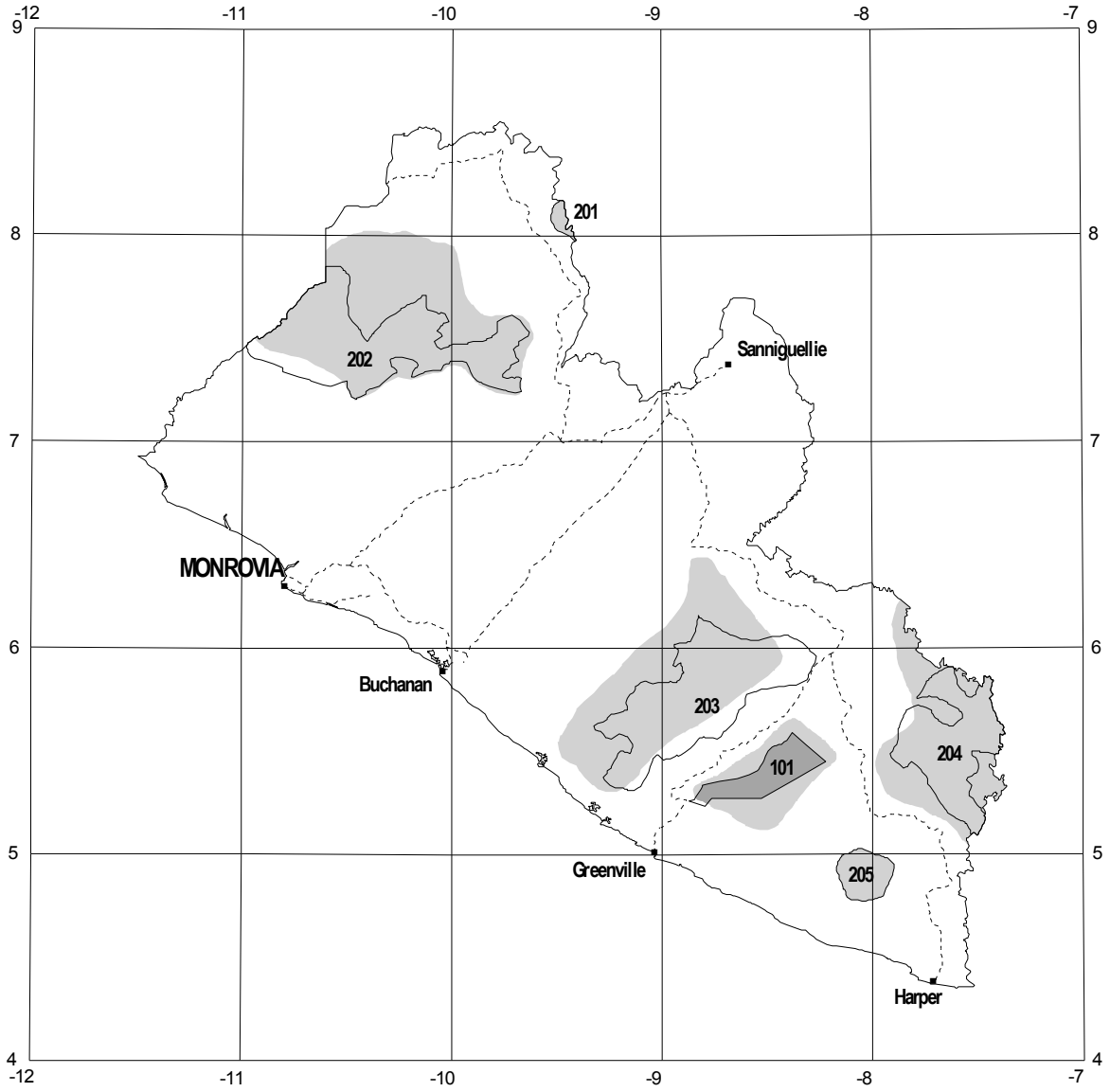
SURVEY ZONES AND ELEPHANT RANGE IN LIBERIA



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 4,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Sapo National Park	430
201	North East National Forest	33
202	Gola, Kpelle and Lorma National Forest	495
203	Krahn Bassa National Forest	495
204	Grebo National Forest	231
205	Barrobo National Forest	99

N

AfESG

African Elephant Database of IUCN/SSC/AfESG
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UNEP

MALI

General Statistics

Country area:	1,240,000km^2
Range area (% of country):	37,024km^2 (3%)
Protected area coverage (% of country):	3%
Protected range (% of range in protected areas):	31%

Range

The only area considered to be elephant range is that of Gourma. According to Pavy (pers comm, 1998) there are no more elephants east of Baoulé National Park , and Niagate (questionnaire reply, 1998) believes there are no longer elephants around the Soussan Forest Reserve.

Surveys and data

The last survey was a dung count by Jachmann (1991). He estimated that there were 611 elephants in the Gourma area. More recently, Niagate (questionnaire reply, 1998) has provided an informed guess of 950 to 1,000 elephants, while Amis des Eléphants, a non-governmental organisation, puts the number at 700 (Pavy, pers. comm., 1998).

Niagate's (questionnaire reply, 1998) informed guess is thought to be accurate and replaces Jachmann's (1991) estimate made using indirect counting methods nearly nine years ago.

Cross-border movements

The Gourma elephants move into northern Burkina Faso in the wet seasons (Spinage, 1985; Pringle & Diakite, 1992; Chardonnet and Koalo, questionnaire reply, 1998).

Issues

The elephants in the Gourma region of Mali inhabit arid habitat and constitute the northern-most elephant population in Africa. They are one of two populations of what some call "desert elephants", the other population being in Namibia. As the last significant population in the Sahel, they are of great conservation importance. Although the World Bank and other organisations have expressed interest in Gourma, no conservation programme has been designed or implemented. However, a detailed study of this population will commence in 1999.

The elephants share most of their range with the pastoralists who pose little direct threat to elephants. However, increasing competition for water could bring conflict between people and elephants because the human population has increased and the locals are turning to cultivation (Pringle & Diakite, 1992).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Mali

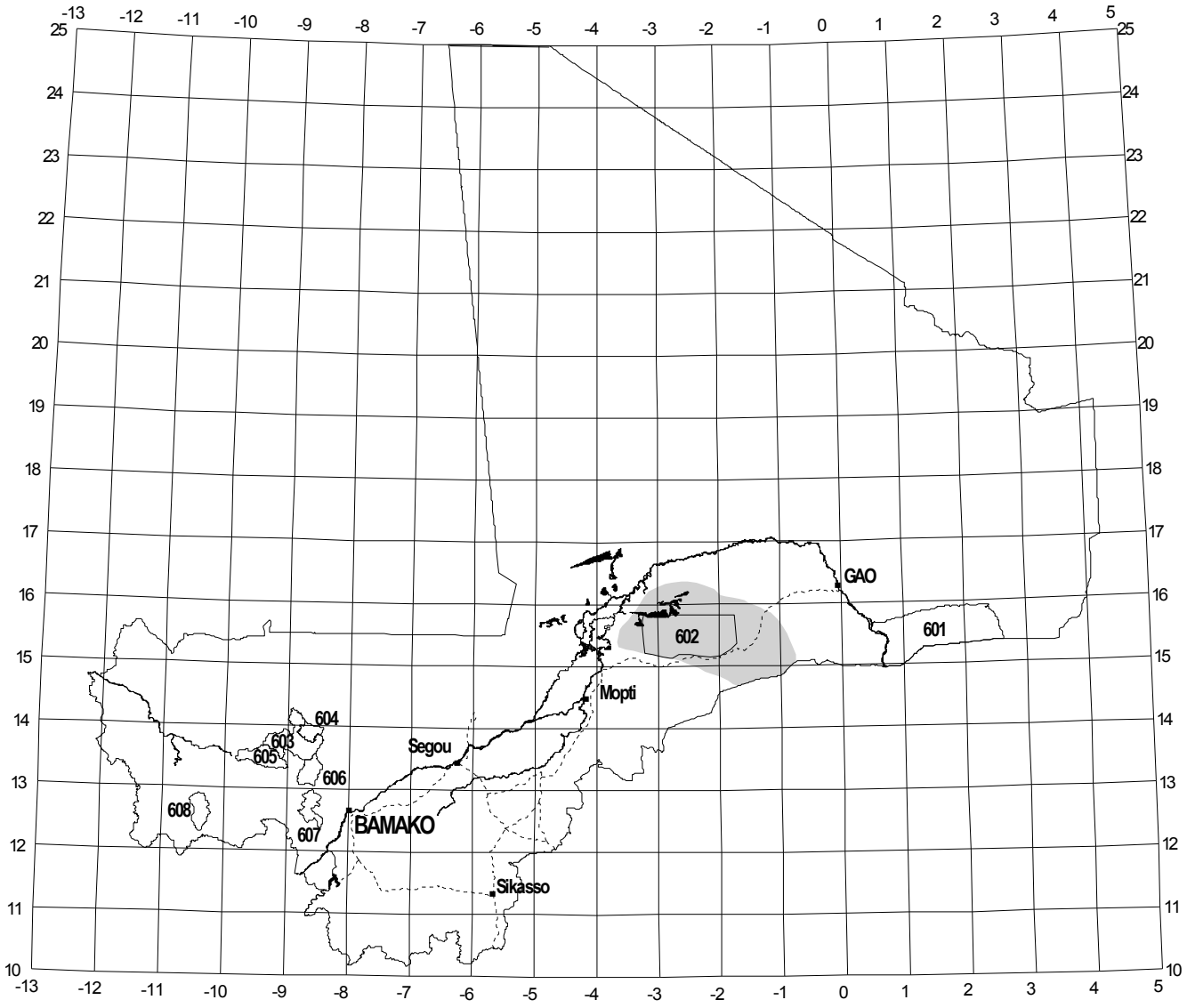
CODE	SURVEY ZONE	YEAR	Area (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
301	Gourma	1998	37,025	950	50*	0.03	Niagate, quest. reply, 1998	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR MALI

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	950	50
E	Other Guesses	0	0	0	0
TOTAL		**0**	**0**	**950**	**50**

PROTECTED AREAS AND ELEPHANT RANGE IN MALI



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 12,500,000

KEY TO PROTECTED AREAS

National Park
603 Baoulé

Faunal Reserve
601 Ansongo-Menaka Giraffe
602 Douentza Elephant
604 Kongossambougou
605 Badinko
606 Fina
607 Kenié-Baoulé
608 Bafing Makana

N

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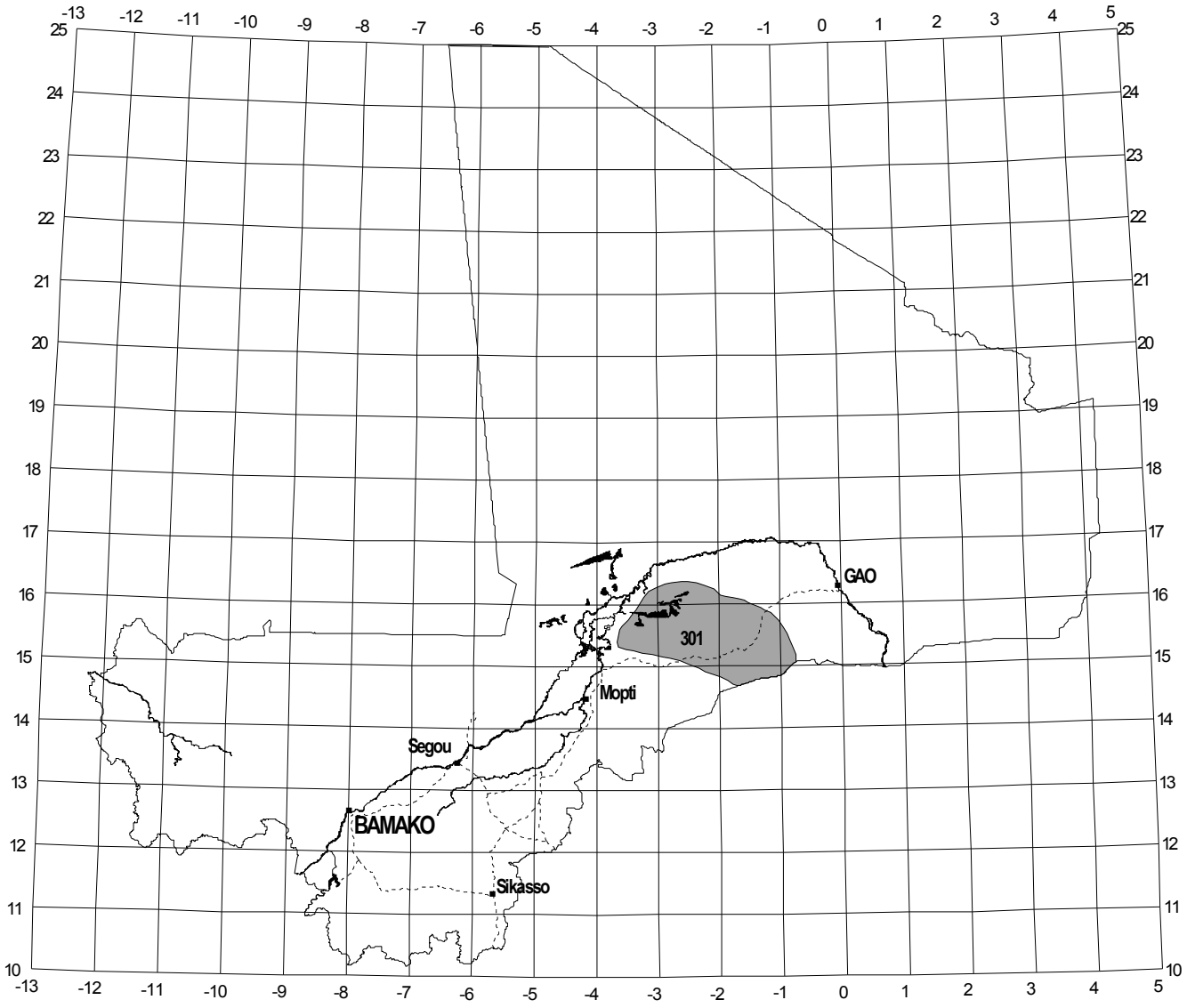
SURVEY ZONES AND ELEPHANT RANGE IN MALI



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 12,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
301	Gourma	950

N

AfESG

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UNEP

NIGER

General Statistics

Country area:	1,267,000km^2
Range area (% of country):	2,694km^2 (2%)
Protected area coverage (% of country):	8%
Protected range (% of range in protected areas):	87%

Range

There are two small areas considered to be elephant range which have not been changed since the last update. The first is in the southeast in W du Niger National Park, a range shared with three other countries (Burkina Faso, Nigeria and Benin). The second is south of the town of Maradi in south-central Niger, the Baban Rafi Forest (Seydou, questionnaire reply, 1998).

Surveys and data

Only one survey has been conducted in the last ten years. An aerial census in 1992 gave estimates of 817 for the W du Niger National Park and 100 for Baban Rafi Forest (Seydou, questionnaire reply, 1998). These estimates are classified as guesses because no survey report was provided.

Cross-border movements

The Baban Rafi Forest elephant population periodically migrates to northern Nigeria, but spends most of its time in Niger because of the availability of food and water (Lake Madourunta). Also, on the Nigerian side, elephants are poached for both meat and ivory (Seydou, 1996).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

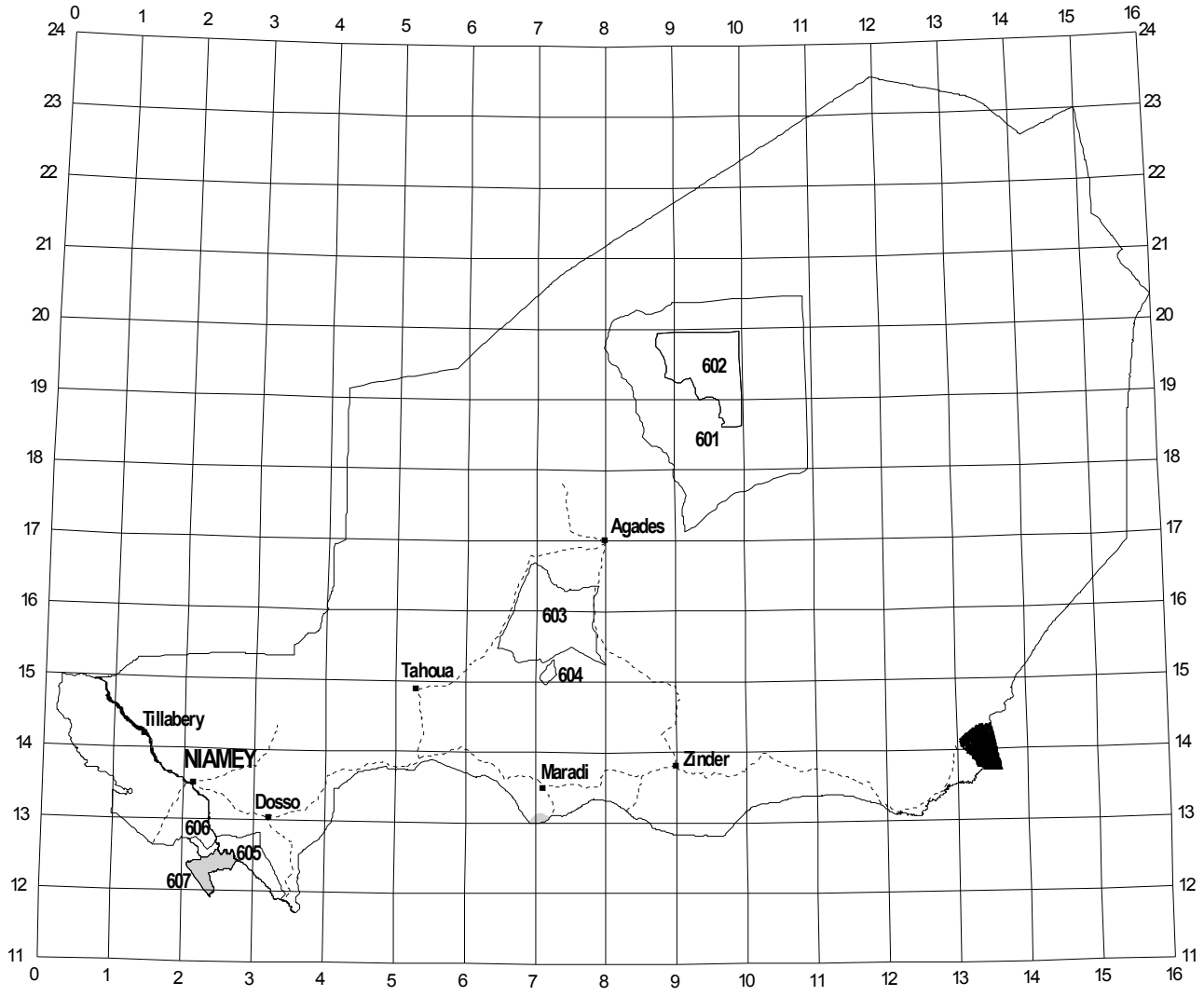
Niger

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	W du Niger National Park	1992	2,200	817		0.37	Seydou, quest. reply, 1998	IG3	D
201	Baban Rafi Forest	1992	430	100		0.23	Seydou, quest. reply, 1998	OG3	E

SUMMARY OF TOTALS FOR NIGER

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	817	0
E	Other Guesses	0	0	0	100
TOTAL		**0**	**0**	**817**	**100**

PROTECTED AREAS AND ELEPHANT RANGE IN NIGER



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 11,500,000

KEY TO PROTECTED AREAS

National Park
607 W du Niger

National Nature Reserve
601 Aïr and Ténéré

Strict Nature Reserve
602 Addax Sanctuary

Total Faunal Reserve
603 Tadres
604 Gadabedji
606 Tamou

Partial Faunal Reserve
605 Dosso

N

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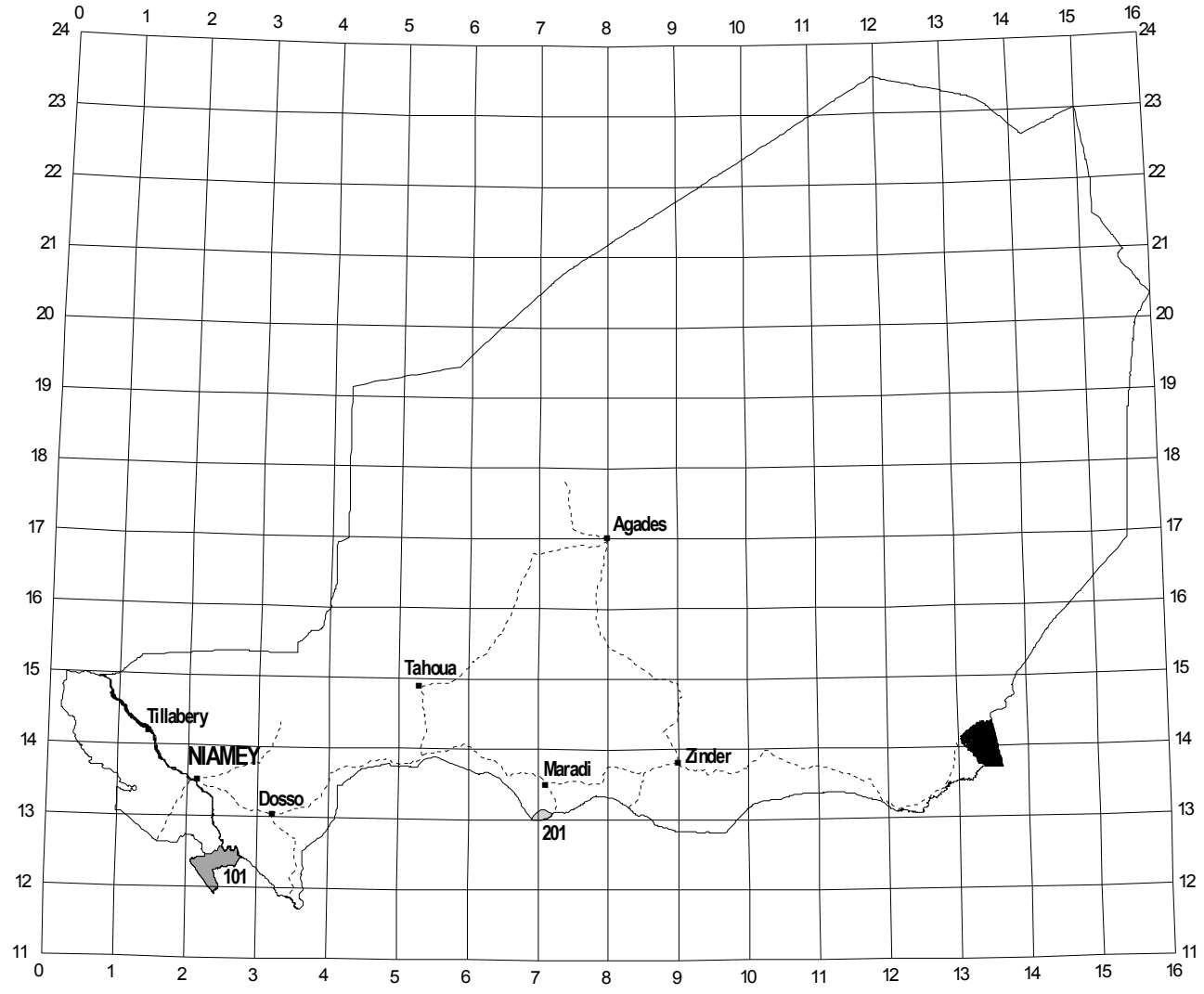
SURVEY ZONES AND ELEPHANT RANGE IN NIGER



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 11,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	W du Niger National Park	817
201	Baban Rafi Forest	100

N

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NIGERIA

General Statistics

Country area:	923,770km^2
Range area (% of country):	32,224km^2 (3%)
Protected area coverage (% of country):	3%
Protected range (% of range in protected areas):	25%

Range

Nigeria's elephants live in small, relict populations which are probably undergoing rapid change in response to human pressures. In the northwest, some range has been added around Lake Chad to reflect information from Bita (1997) and Mshelbwala (1998). Range has also been added south of the Sambisa Game Reserve (Bita, 1997).

Surveys and data

Mshelbwala (1998) estimates that there are between 1,400 and 1,500 elephants in Nigeria, but recent survey data to support the estimate are scanty. Dickinson (1995) conducted a reconnaissance survey in the Oban Division of Cross River National Park (which was declared a national park in 1991) in March and August of 1995. He examined 200km of hunters' paths, footpaths and logging trails and 30 km of line transects in the Oban Hills but only 21 elephant droppings were see. Obot *et al.*, (1998) carried out a dung count in the Okwangwo Division of Cross River National Park and provided the estimate of 74 elephants used in this update. The remaining estimates have been provided by Gawaisa (questionnaire reply, 1998) for Gashaka-Gumti National Park, Madagali, Kopre and Kambari, and by Mshelbwala (1998) for Yankari National Park and Omo Forest Reserve, mainly based on guesswork. Gawaisa (questionnaire reply, 1998) does, however, report that in Gashaka-Gumpti National Park and Madagali/Kopre, elephants were actually seen (seven and 150 respectively), but no information is provided about the surveys. These estimates, therefore, have been placed in the **Definite** category although the survey type for each area is classified as an informed guess.

Cross-border movements

Cross-border movements of elephants probably occur from both northern savanna and southern forest populations. Mshelbwala (1998) reported that elephants move across from Waza National Park in Cameroon and are now spending longer periods of time in Chingurmi-Duguma. Bita (1997) believes that the migratory population may still move between Cameroon, Chad and Nigeria though the seasonal migration from Waza National Park to Lake Chad is now rarely seen.

Elephants may also move between Nigeria and the Baban Rafi Forest in Niger (Seydou, 1996).

Issues

Many of the protected areas are of uncertain or changing status. Of all the elephant populations, only that of Yankari in northern Nigeria has good prospects for survival (Dougherty, 1994). In the Lake Chad area elephants may have entirely disappeared following intense human-elephant conflict and general insecurity in the area (Bita, 1997). Similarly, Oates (pers. comm., 1998) speculates that there may be no more elephants in Taylor Creek.

Nigeria is an important hub for ivory moving illegally from Central Africa into West Africa (Dublin *et al.*, 1995). Two hundred and twenty-one illegal consignments of ivory from Nigeria were seized between 1990 and 1993 (Dublin *et al.*, 1995) and one shipment from Nigeria seized in 1998 weighed almost 1.5 tonnes (Milliken, pers. comm., 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Nigeria

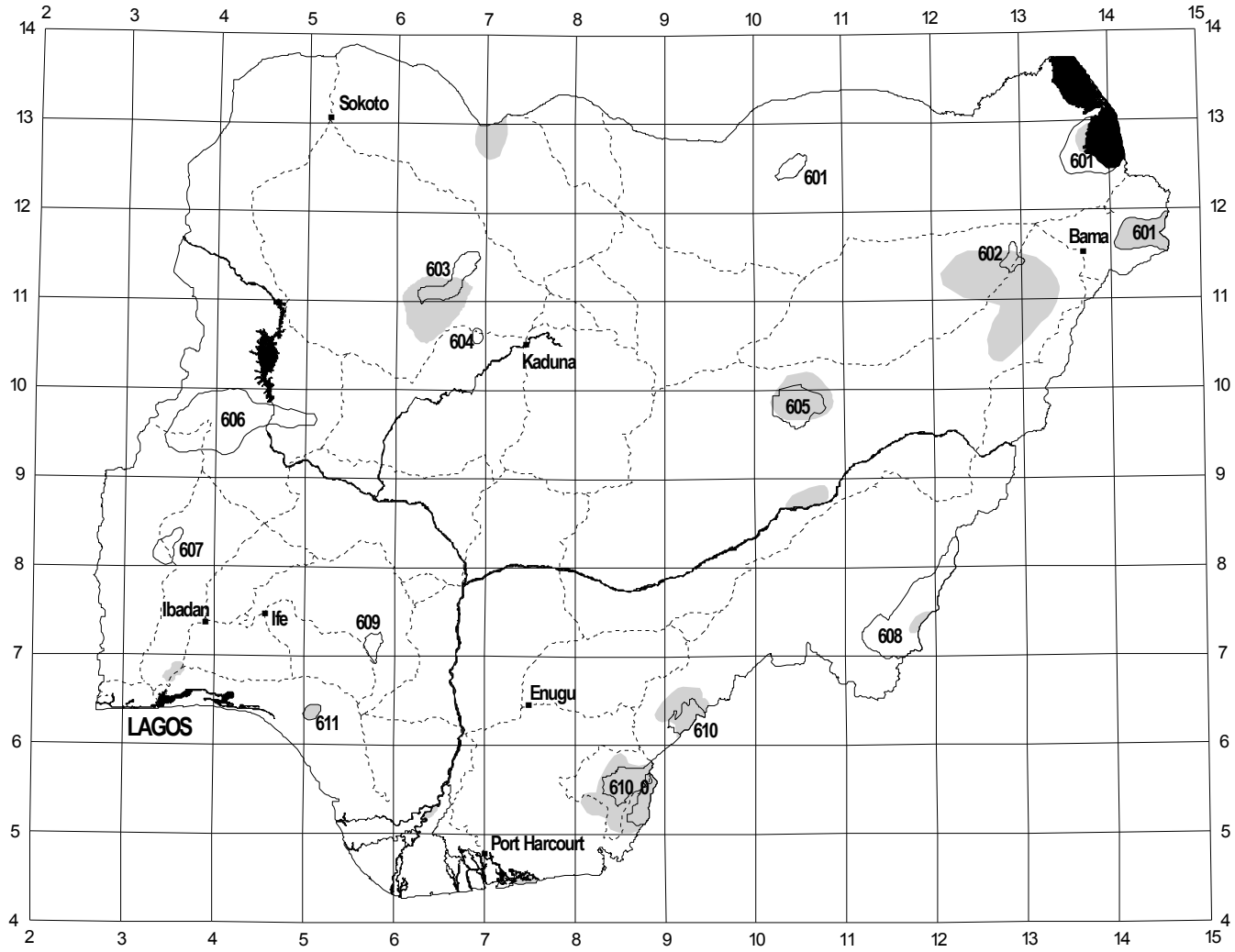
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Chingurmi-Duguma Sector, Chad Basin National Park	1994	2,160	100		0.05	Mshelbwala, 1998	IG3	D
102	Kwiambana Game Reserve	1993	1,715	80	40*	0.05	Hurst, quest. reply, 1994	IG3	D
103	Yankari National Park	1993	2,254	463		0.21	Mshelbwala, 1998	IG3	D
104	Gashaka-Gumti National Park	1997	5,860	10		0.00	Gawaisa, quest. reply, 1998	IG3	D
105	Okwangwo Division, Cross River National Park	1998	239	74	56*	0.31	Obot *et al*., 1998	DC3	D
106	Okomu Game Sanctuary	1991	1,082	40		0.04	NRCC, 1991	OG3	E
201	Madagali and Kopre	1996	5,600	200	50*	0.03	Gawaisa, quest. reply, 1998	IG3	D
202	Kambari	1998	2,000	5	10*	0.00	Gawaisa, quest. reply, 1998	IG3	D
203	Omo Forest Reserve	1994	1,300	30	20*	0.02	Mshelbwala, 1998	IG3	D
204	Taylor Creek	1993	145	25		0.17	Powell, in Thouless, 1993	IG3	D
205	Andoni Island	1993	215	30	20*	0.14	Thouless, 1993	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR NIGERIA

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	**Probable**	**Possible**	**Speculative**
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	157	0	860	196
E	Other Guesses	0	0	0	40
TOTAL		**157**	**0**	**860**	**236**

PROTECTED AREAS AND ELEPHANT RANGE IN NIGERIA



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 9,000,000

KEY TO PROTECTED AREAS

National Park
601 Chad Basin
605 Yankari
606 Kainji Lake
607 Old Oyo
608 Gashaka-Gumti
610 Cross River

Game Reserve
602 Sambisa
603 Kwiambana
604 Kamuku
609 Ifon

Game Sanctuary
611 Okomu

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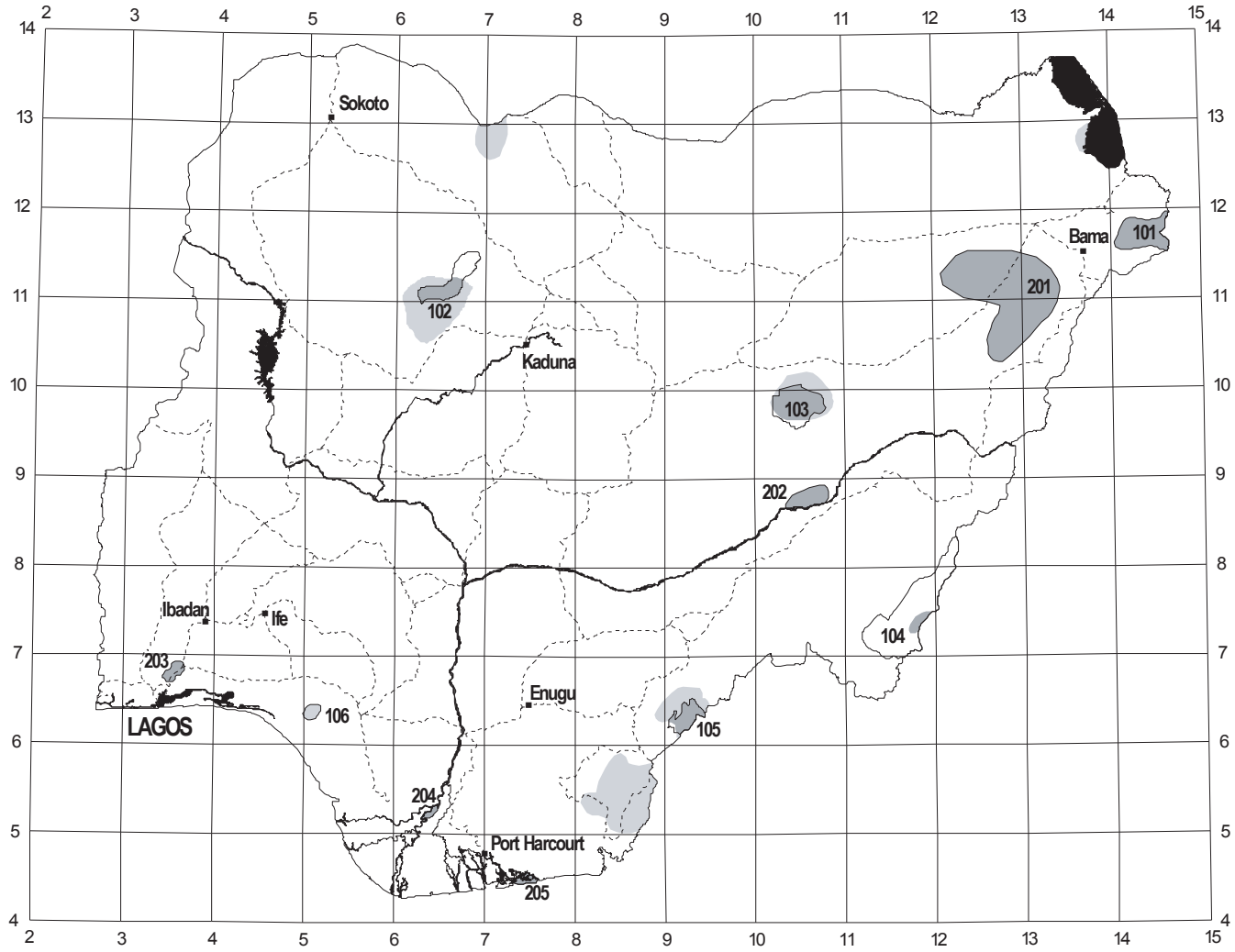
SURVEY ZONES AND ELEPHANT RANGE IN NIGERIA



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 9,000,000

KEY TO ZONE NAMES
NP National Park
GR Game Reserve
GS Game Sanctuary
FR Forest Reserve

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Chingurmi-Duguma Sector/ Chad Basin NP	100
102	Kwiambana GR	80
103	Yankari NP	463
104	Gashaka-Gumti NP	10
105	Okwangwo Division, Cross River NP	74
106	Okomu GS	40
201	Madagali and Kopre	150
202	Kambari	5
203	Omo FR	30
204	Taylor Creek	25
205	Andoni Island	30

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SENEGAL

General Statistics

Country area:	196,190km^2
Range area (% of country):	8,428km^2 (4%)
Protected area coverage (% of country):	11%
Protected range (% of range in protected areas):	100%

Range

Historically, elephants ranged over most of Senegal and in all major habitats of the country (Burnham, pers. comm., 1998). Today elephants are found only in Niokola Koba National Park, which lies in the southwest. This range has not changed from the last update (Kane, pers. comm., 1998)

Surveys and data

While no surveys have been carried out, Kane estimates 20 to 30 elephants based on sightings (nine elephants were actually seen) and elephant signs. Clarke (pers. comm., 1996) estimated 44 elephants using similar methods.

Cross-border movements

Elephants may move from the Niokola Koba National Park into Guinea, though there is no information available.

Issues

The future of the last remaining elephant population in Senegal remains uncertain as human population pressure on natural resources and land continues to increase (Burnham, pers comm, 1998).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

Senegal

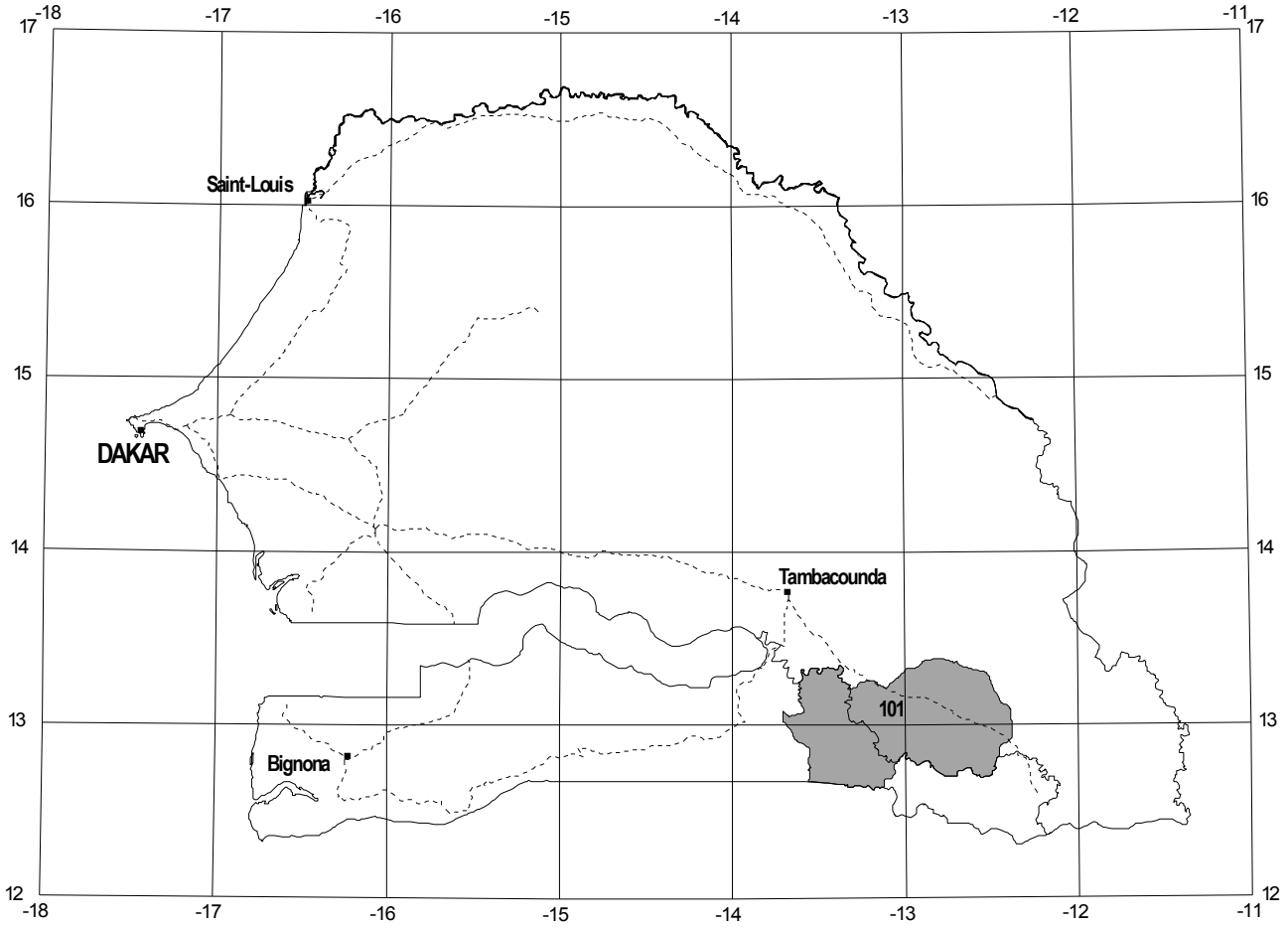
CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Niokola-Koba National Park	1998	9,130	20	10*	0.00	Kane, pers. comm. 1998	IG3	D

*Range of Informed Guess

SUMMARY OF TOTALS FOR SENEGAL

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	9	0	11	10
E	Other Guesses	0	0	0	0
TOTAL		**9**	**0**	**11**	**10**

SURVEY ZONES AND ELEPHANT RANGE IN SENEGAL



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 5,000,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Niokolo-Koba National Park	20

N

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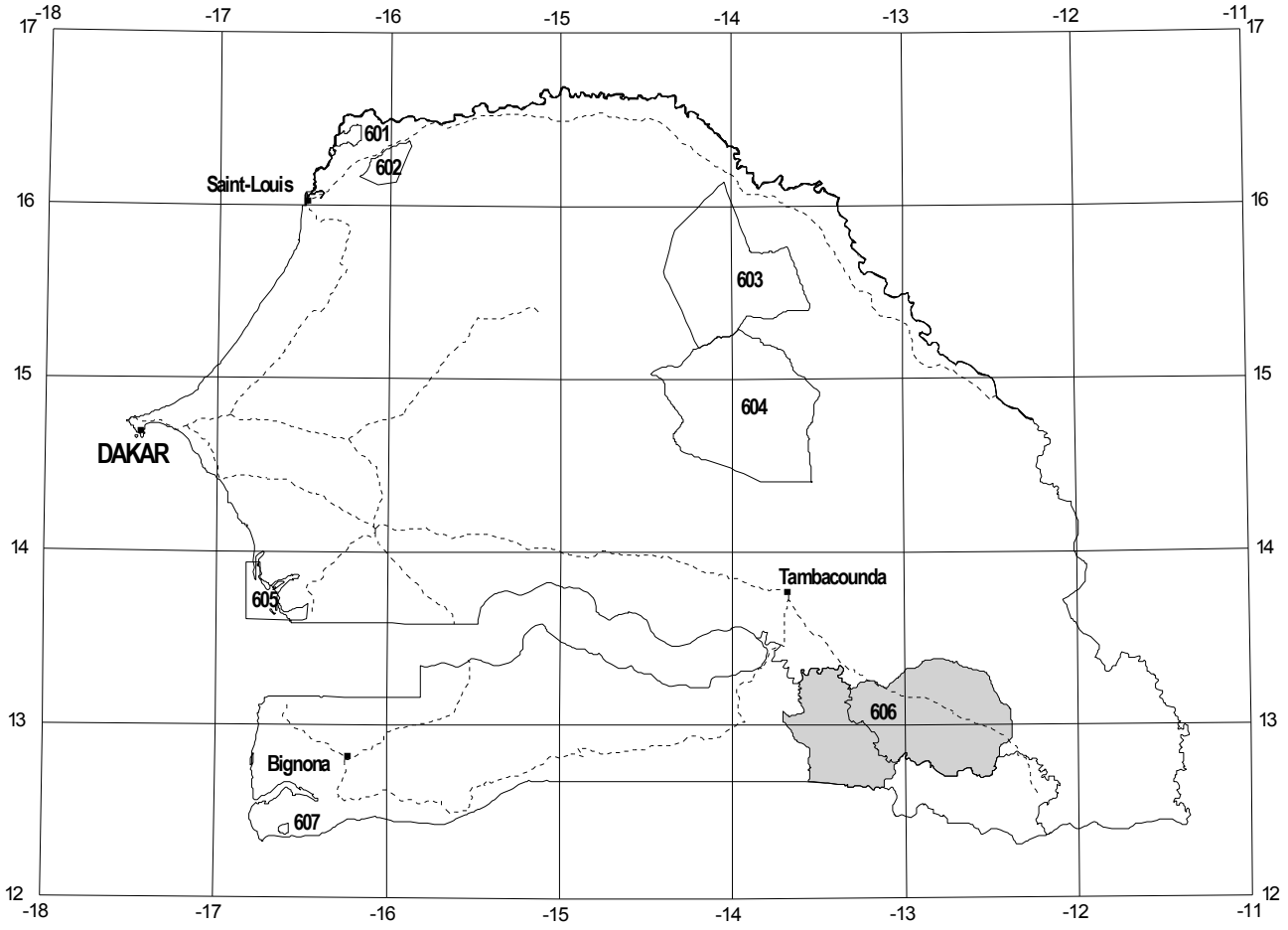
PROTECTED AREAS AND ELEPHANT RANGE IN SENEGAL



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 5,000,000

KEY TO PROTECTED AREAS

National Park
601 Djoudj
605 Delta du Saloum
606 Niokolo-Koba
607 Basse-Casamance

Faunal Reserve
602 Ndiael
603 Ferlo-Nord
604 Ferlo-Sud

N

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SIERRA LEONE

General Statistics

Country area:	71,740km^2
Range area (% of country):	2,914km^2 (4%)
Protected area coverage (% of country):	1%
Protected range (% of range in protected areas):	15%

Range

Information on range originates from Davies (questionnaire reply, 1993) and Wood (questionnaire reply, 1993). No new information has been received.

Surveys and data

There have been no elephant surveys or estimates in Sierra Leone in the last ten years.

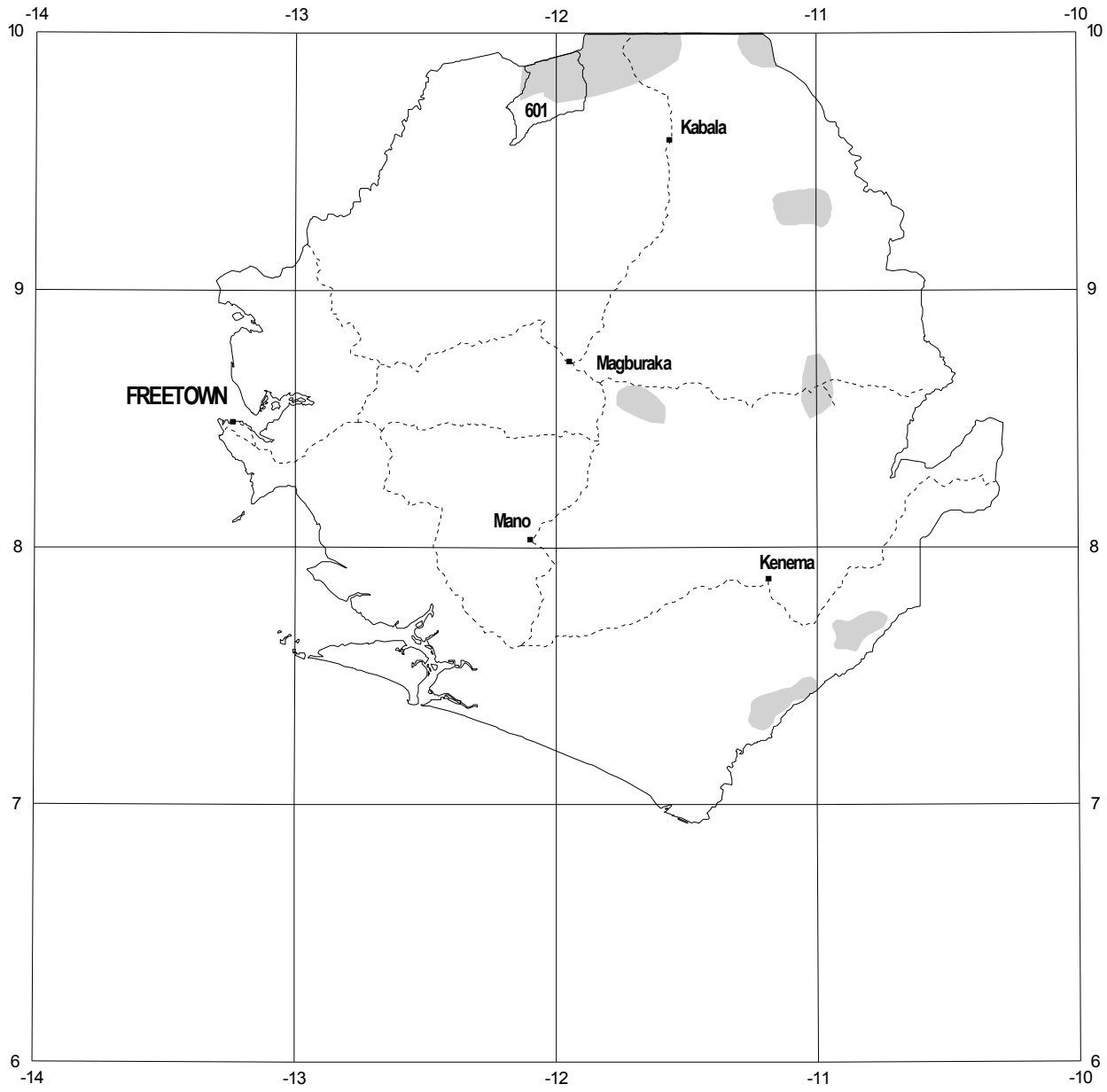
Cross-border movements

Elephants may move from Sierra Leone into Guinea and Liberia, but there is no information available.

Issues

Nothing is known about Sierra Leone's elephant populations, and no surveys can be undertaken until the current civil conflict ends.

PROTECTED AREAS AND ELEPHANT RANGE IN SIERRA LEONE



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

KEY TO PROTECTED AREAS

National Park
601 Outamba-Kilimi

N

Scale 1 : 3,000,000

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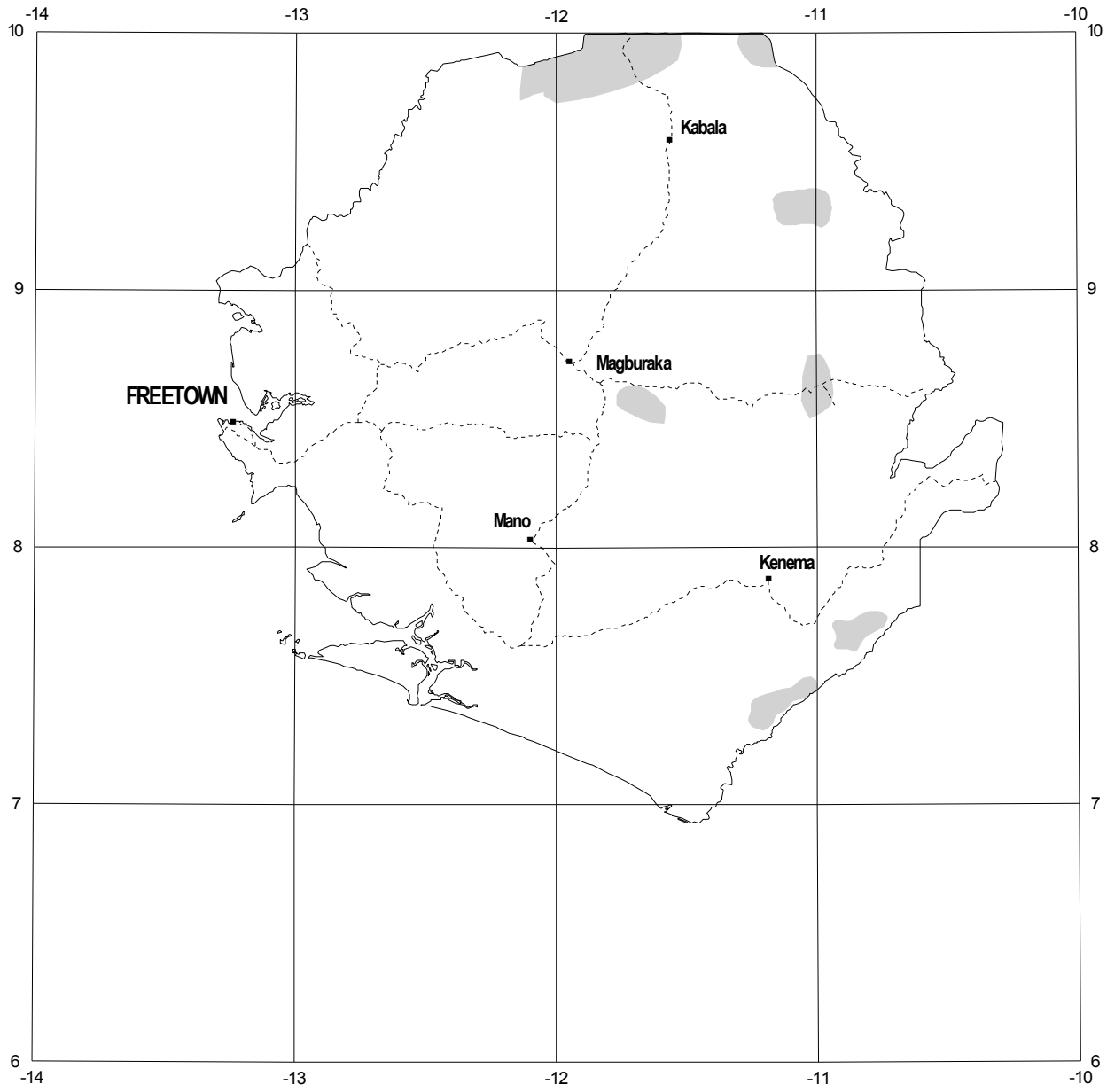
SURVEY ZONES AND ELEPHANT RANGE IN SIERRA LEONE



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 3,000,000

KEY TO POPULATION ESTIMATES

No recent censuses have been carried out in Sierra Leone

N

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TOGO

General Statistics

Country area:	56,790km^2
Range area (% of country):	5,430km^2 (10%)
Protected area coverage (% of country):	11%
Protected range (% of range in protected areas):	96%

Range

Information on range has been updated by Okoumassou (questionnaire reply, 1998; Okoumassou *et al*., 1998). There are two distinct areas of elephant range, one in the northwest of the country and the other in the central portion.

Since the 1995 AED update the ranges for Galangashie, Abdoulaye and Fosse aux Lions have been removed (Okoumassou, questionnaire reply, 1998). These areas no longer support any elephants due to intense agricultural encroachment. However, the range west of Fosse aux Lions (Doung-Pana), on the border with Ghana, has been retained on the map.

Surveys and data

New estimates, classified as informed guesses, have been provided based on field work conducted by the Direction des Parcs Nationaux des Reserves de Faune et de Chasses (DPNRFC) in 1995 (DPNRFC, 1995) and by Okoumassou (questionnaire reply, 1998). Further survey work is required in all elephant areas to improve these estimates.

The new estimates from DPNFRC and Okoumassou replaced those of Chardonnet (1988) and Douglas Hamilton *et al.* (1992). Both DPNRFC and Okoumassou provided estimates for Keran National Park. However, Okoumassou's estimate was based on a detailed study of elephant distribution and human-elephant conflict in the area around the Park (Okoumassou *et al.* 1998), and was therefore considered to be more accurate.

Cross-border movements

Tanghanwaye (questionnaire reply, 1993), Okoumassou *et al.* (1998) and Sam *et al*. (1998) all report movements of elephants from Togo to Ghana and Burkina Faso. It is possible that elephants also move into Benin.

Issues

As in many countries in Africa, human-elephant conflict has become a major management issue for Togo. The problem may be more acute in Togo because of the small size of the country and the close proximity between elephants and people (Sam *et al*., 1998). The situation is further exacerbated by the large-scale destruction of elephant habitat (DPNFRC, 1995).

RECENT ELEPHANT ESTIMATES (-1998)

SURVEY TYPE is keyed as follows:

AS	Aerial Sample Count
AT	Aerial Total Count
DC	Dung Count
GS	Ground Sample Count
GT	Ground Total Count
IR	Individual Registration
IG	Informed Guess
OG	Other Guess

SURVEY QUALITY is keyed from 1 (best) to 3 (worst)

SURVEY RELIABILITY is keyed from A (best) to E (worst)

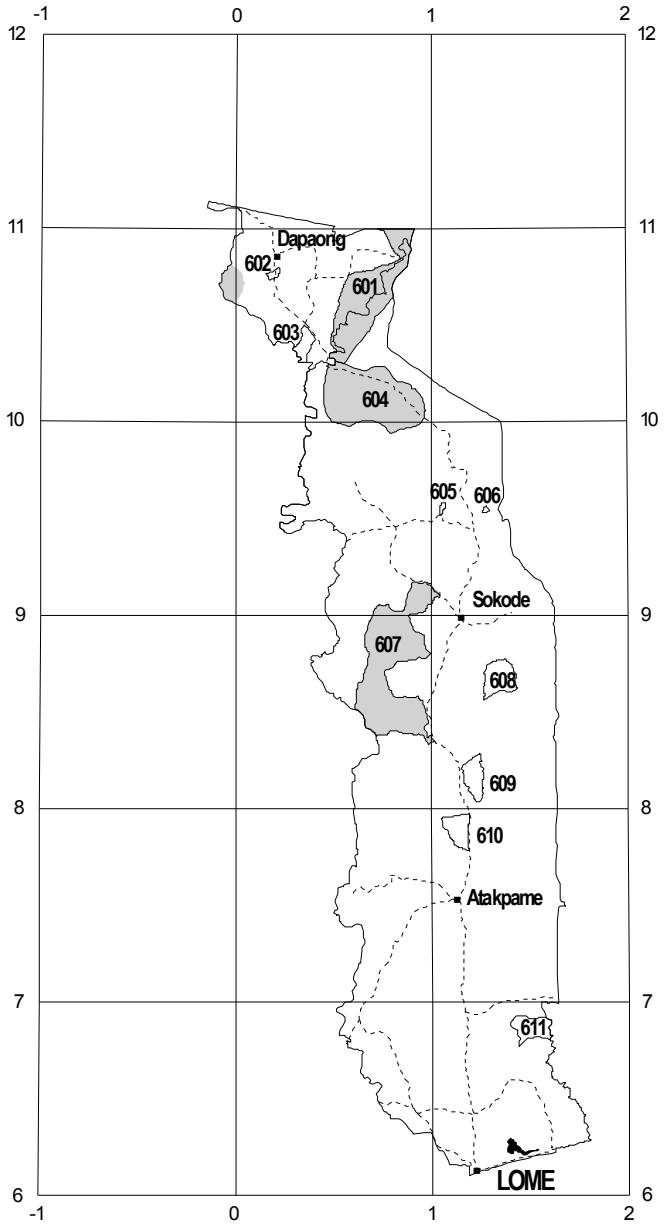
Togo

CODE	SURVEY ZONE	SURVEY YEAR	AREA (km^2)	NUMBER OF ELEPHANTS			SOURCE	SURVEY TYPE & QUALITY	SURVEY RELIA-BILITY
				Estimate	95% C.L.	Density (no/km^2)			
101	Oti-Mandouri Faunal Reserve	1995	1,478	35		0.02	DPNRFC, 1995	IG3	D
102	Kéran National Park	1998	1,636	16		0.01	Okoumassou, quest. reply, 1998	IG3	D
103	Fazao-Malfakassa National Park	1995	1,920	30		0.02	DPNRFC, 1995	IG3	D
201	Doung-Pana	1995	210	15		0.07	DPNRFC, 1995	IG3	D

SUMMARY OF TOTALS FOR TOGO

SURVEY RELIABILITY	SURVEY TYPE	NUMBER OF ELEPHANTS			
		Definite	Probable	Possible	Speculative
A	Aerial or Ground Total Counts	0	0	0	0
B	Aerial or Ground Sample Counts	0	0	0	0
C	Dung Counts	0	0	0	0
D	Informed Guesses	0	0	96	0
E	Other Guesses	0	0	0	0
TOTAL		**0**	**0**	**96**	**0**

PROTECTED AREAS AND ELEPHANT RANGE IN TOGO



LEGEND

- Town
- Road
- River
- Lake
- Protected Area
- Elephant Range

Scale 1 : 4,500,000

KEY TO PROTECTED AREAS

National Park
602 Fosse aux Lions
604 Kéran
607 Fazao-Malfakassa

Faunal Reserve
601 Oti-Mandouri
603 Galangashie
605 Djamdè
606 Sirka
608 Abdoulaye
609 Kpessi
610 Akaba
611 Togodo

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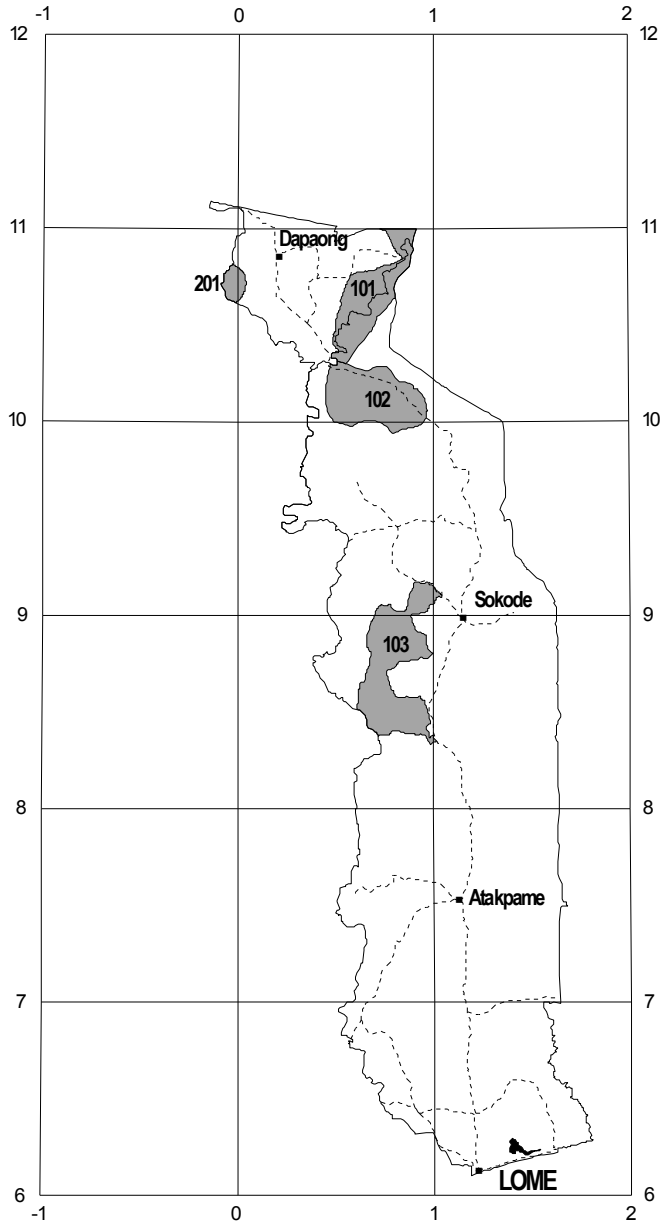
SURVEY ZONES AND ELEPHANT RANGE IN TOGO



LEGEND

- Town
- Road
- River
- Lake
- Survey Zone
- Surveyed Range
- Unsurveyed Range

Scale 1 : 4,500,000

KEY TO POPULATION ESTIMATES

CODE	ZONE NAME	ESTIMATE
101	Oti-Mandouri Faunal Reserve	35
102	Kéran National Park	16
103	Fazao-Malfakassa National Park	30
201	Doung-Pana	15

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REFERENCES

ABDI, M. pers.comm. 1998. Letter to Willy Simons. 16 July 1998.

AHMED, M. 1998. AfESG questionnaire reply, January 1998.

AHT INTERNATIONAL. 1997. Aerial surveys of Vwaza Marsh Wildlife Reserve and Nyika National Park, September 1997.

ALERS, M.P.T., BLOM, A., SIKUBWABO KIYENGO, C., MASUNDA, T. and BARNES, R.F.W. 1992. Preliminary assessment of the status of the forest elephant in Zaire. *African Journal of Ecology* 30, 279-291.

ALLEN-ROWLANDSON, T.S. 1990. Elephant survey in Ethiopia January – February 1990. Unpublished report to WWF, May 1990. 19pp.

ANON. 1993. Working Group Discussion One. Aerial Survey Working Group. *Pachyderm* 16,21-23.

ANSTEY, S. 1993. Angola: elephants, people and conservation. A preliminary assessment of the status and conservation of elephants in Angola. Project Report. IUCN Regional Office for Southern Africa. May 1993. 26pp.

ANSTEY, S. and DUNN, A. 1991. Forest elephants in Liberia: status and conservation. Unpublished report to WWF. March 1991. 58pp.

ARMBRUSTER, P. and LANDE, R. 1993. A population viability analysis for African elephant (*Loxodonta africana*): how big should reserves be? *Conservation Biology* 7, 602-610.

ARRANZ, L. pers. comm. 1995. Fax to Ruth Chunge, 18 November 1995.

BALFOUR, D. pers. comm. 1998. E-mail to Willy Simons, 20 May, 1998.

BARNES, R.F.W. and JENSEN, K.L. 1987. How to count elephants in forests. *IUCN African Elephant & Rhino Specialist Group Technical Bulletin* 1, 1-6.

BARNES, R.F.W. 1993. Indirect methods for counting elephants in forest. *Pachyderm* 16, 24-30.

BARNES, R.F.W., BLOM, A.. ALERS, M.P.T. and BARNES, K.L. 1995a. An estimate of the numbers of forest elephants in Gabon. *Journal of Tropical Ecology* 11, 27-37.

BARNES, R.F.W., AZIKA, S., ASAMOAH-BOATENG, B. 1995b. Timber, cocoa, and crop-raiding elephants: a preliminary study from southern Ghana. *Pachyderm* 19, 33-38.

BARNES, R.F.W., BEARDSLEY, K., MICHELMORE, F., BARNES, K., ALERS, M.P.T. 1997. Estimating forest elephant numbers with dung counts and geographic information system. *Journal of Wildlife Management* 61(4), 1384-1393.

BARRY, I. and CHARDONNET, B. 1998. Recensement aérien de la faune de l'unit, de conservation d'Arly; Résultats et commentaires. Ministère de l'environment et de l'eau, Burkina Faso. 37pp.

BAUER, J. 1995. AfESG questionnaire reply, 28 October 1995.

BEARDSLEY, K. 1993. Final report to the African Elephant Specialist Group Taskforce. December 1993. 22pp with 11 appendices.

BHIMA, R. 1996. Estimation of elephant numbers in some protected areas in Malawi. A report submitted to the ELESMAP Project. 12pp.

BHIMA, R. 1998a. AfESG questionnaire reply, 1998.

BHIMA, R. 1998b. AfESG questionnaire reply, January 1998.

BITA, B.B. 1997. Current elephant conservation problems in Borno State, Nigeria. *Pachyderm* 23, 19-23.

BITOK, E.K. 1997. A survey of the Loroki-Kirisia Forest Reserve elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 13pp.

BITOK, E.K., MWATHE, K., KULOBA, B.M., KONES, D.C., MWANGI, S., OMONDI, P. and WAITHAKA, J. 1997. A survey of upper and lower Imenti forest elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 10pp.

BITOK, E.K., MWANGI, S., NYAMU, J. and NDIRANGU, G. 1998. A survey of Aberdare Forest elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 11pp.

BIZIMANA, J. pers. comm. 1998. Fax to Greg Overton. 1 September 1998.

BLOM, A. pers. comm. 1998. E-mail to Willy Simons. 6 October 1998.

BOSSOU, E. 1998. AfESG questionnaire reply, July 1998.

BURNHAM, O. pers. comm. 1998. Fax to Greg Overton, 7 May 1998.

BURRILL, A. and DOUGLAS-HAMILTON, I. 1987. African Elephant Database Project: Final report - Phase One. *United Nations Environment Programme. GRID Case Study Series No.2* June 1987. 86pp.

BURROUGH, P.A. 1986. Principles of Geographic Information Systems for land resources assessment. *Monographs on soil and resources survey No 12* Oxford Scientific Publications.

CASTLEY, J.G. and KNIGHT, M.H. 1998. Helicopter based survey of Addo Elephant National Park - February 1998. Internal report, Scientific Services, South African National Parks Board, Kimberley, South Africa. 6pp.

CHAMBAL, M. 1998a. AfESG questionnaire reply, 29 July 1998

CHAMBAL, M. 1998b. AfESG questionnaire reply, January 1998.

CHAPMAN, L.J., CHAPMAN, C.A. and WRANGHAM, R.W. 1992. *Balanites wilsonia*: elephant dependent dispersal? *Journal of Tropical Ecology* 8, 275-283.

CHARDONNET, B. 1988. Les éléphants au Togo. *Revue Elev. Med. Vet. Pays trop*. 41,303-305.

CHARDONNET, B. pers. comm. 1998. E-mail to AED manager, 28 May 1998.

CHARDONNET, B. and KOALO, K. 1998. AfESG questionnaire reply, May 1998.

CHEGE, G.S. 1998. A survey of the Nguruman Area elephant population and human elephant conflicts. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 11pp.

CITES MANAGEMENT AUTHORITY (UGANDA). 1998. Country Report for Uganda. IUCN/SSC African Elephant Specialist Group (AfESG) meeting 26-31st January 1998, Ouagadougou, Burkina Faso. Unpublished report. 4pp.

CLARKE, B. pers. comm. 1998. Letter to Ruth Chunge, 23 April 1996.

CRAIG, G.C. 1993a. Requirements for prediction of the tree/elephant equilibrium in Zimbabwe. Paper presented at the International Seminar on the Conservation of the Asian Elephant, Mudumulai Wildlife Sanctuary, 13-18 June 1993.

CRAIG, G.C. 1993b. Options for aerial surveys of elephants. *Pachyderm* 16, 15-20.

CRAIG, G. C. 1996. ELESMAP Final Technical Report, CEC Project no. B7-5040. December 1996. 41pp.

CUMMING, D.H.M. and JACKSON, P. 1984. The status and conservation of Africa's elephants and rhinos. Proceedings of the joint meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, Hwange Safari Lodge, August 1981.

CUMMING, D.H.M., DU TOIT, R.F. and STUART, S.N. 1990. African Elephants and Rhinos Status Survey and Conservation Action Plan. IUCN/SSC African Elephant and Rhino Specialist Group, IUCN, Gland, Switzerland. 72pp.

DAVIES, G. 1993. AfESG questionnaire reply, October 1993.

DE BOER, pers. comm. 1998. E-mail to Greg Overton. 14 August, 1998.

DEJACE, P. 1996. Suivi des éléphants dans le Sud du Tchad. Direction des Parcs Nationaux et Reserves de Faune (DPNRF), Tchad. Unpublished report. 13pp.

DEMEKE, Y. 1997. The status of the African elephant (*Loxodonta africanus*) in Ethiopia. *Walia* no 18, 15-27.

DEMEKE, Y. pers. comm. 1998. Letter to Greg Overton. 5 August 1998.

DICKINSON, B. 1995. A reconnaisance survey of the elephant population in the Oban Division of Cross River National Park, Nigeria. March and August 1995. Unpublished report, 53pp.

DNFFB (DIRECCAO NACIONAL DE FLORESTAS E FAUNA BRAVIA). 1998. Draft proposal for the development of a national elephant management plan, submitted to the AfESG.

DNFW AND KFW (DIRECTION NATIONALE DES FORETS ET FAUNE and KREDITANSTADT FUR WIEDERAUFBAU). 1997. Mission d'appui à la section biodiversité. Rapport de mission (août-septembre 1997) République de Guinée. Projet de Gestion des Ressources Rurales (PGRR). Unpublished report. 29pp.

DNPWLM (DEPARTMENT OF NATIONAL PARKS AND WILDLIFE MANAGEMENT ZIMBABWE). 1996a. Aerial census of elephant and other large mammals in the Gonarezhou, Zambezi Valley, North-West Matabeleland, Sebungwe, Dande and Communal Land Regions of Zimbabwe. July to November 1995. Department of National Parks and Wild Life Management, Harare, Zimbabwe. Unpublished report. 136pp.

DNPWLM (DEPARTMENT OF NATIONAL PARKS AND WILDLIFE MANAGEMENT ZIMBABWE). 1996b. Aerial census of elephant and other large mammals in the North West Matabeleland and Gonarezhou Regions of Zimbabwe. August/September 1996. Department of National Parks and Wild Life Management, Harare, Zimbabwe. Unpublished report. 95pp.

DOUGHERTY, N. 1994. Nigeria's elephants: characterizing pachyderm problems in West Africa. *Swara* 17, 2-27.

DOUGLAS-HAMILTON, I. 1977-1979. The African Elephant Survey and Conservation Programme. Annual Report Summaries in WWF Yearbooks.

DOUGLAS-HAMILTON, I. 1979. African elephant ivory trade – Final Report to US Fish and Wildlife Service.

DOUGLAS-HAMILTON, I., FROMENT, J.M., DOUNGOUBE, G. and ROOT, J. 1985. Aménagement faune République Centrafricaine. Recensement aérien de la faune dans la Zone Nord de la République Centrafricaine. FAO Report. FO:CAF/78/006. Document de travail 5. 8pp.

DOUGLAS-HAMILTON, I., MICHELMORE, F. and INAMDAR, A. 1992. *African Elephant Database*. United Nations Environment Programme. February 1992. 176pp.

DOUGLAS-HAMILTON, I., GACHAGO, S., LITOROH, M. AND MIRANGI, J. 1994. Tsavo Elephant Count 1994 Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 60pp.

DOUGLAS-HAMILTON, I. 1998. Tracking elephants with global position system radio collars. *Pachyderm* 25, 81-92.

DPNRF (DIRECTION DES PARCS NATIONAUX ET RESERVES DE FAUNE), TCHAD. 1991. Parc National de Zakouma: resultats des inventaires de la faune. République du Tchad; Ministère de l'Environnement et du Tourisme. Projet "Rehabilitation et conservation du parc national de Zakouma". February 1991. Unpublished report.

DPNRFC (DIRECTION DES PARCS NATIONAUX, DES RESERVES DE FAUNE ET DE CHASSES). 1995. Données de base de la sous population d'eléphants d'Afrique du Togo. Ministère de l'Environment et du Tourisme, Republique Togolaise. Unpublished report. 13 pp.

DRSRS (DEPARTMENT OF RESOURCE SURVEYS AND REMOTE SENSING). 1997. Data summary reports provided to Willy Simons.

DUBLIN, H.T., MILLIKEN, T. and BARNES, R.F.W. 1995. *Four years after the CITES ban: illegal hunting of elephants, ivory trade and stockpiles.* A report of the IUCN/SSC African Elephant Specialist Group. 110pp.

DUDLEY, J.P., MENSAH-NTIAMOAH, A.Y. and KPELLE, D.G. 1992. Forest elephants in a rainforest fragment: preliminary findings from a wildlife conservation project in southern Ghana. *African Journal of Ecology* 30, 116-126.

DULLING, Col. J.P. 1992. African elephant status and general wildlife situation in the Sudan. Unpublished report. 27th January - 31st January 1992. 16pp.

DWNP (DEPARTMENT OF WILDLIFE AND NATIONAL PARKS). 1995. Aerial census of animals in northern Botswana, dry season 1995. Department of Wildlife and National Parks, Botswana. Unpublished report.

DWNP (DEPARTMENT OF WILDLIFE AND NATIONAL PARKS). 1996. Aerial census of animals in northern Botswana, dry season 1996. Department of Wildlife and National Parks, Botswana. Unpublished report.

EAST, R. 1995. Antelope Survey Update. Number 1: August 1996.

EAST, R. 1996. Antelope Survey Update. Number 2: September 1996.

EAST, R. 1997. Antelope Survey Update. Number 5: June 1997.

EAST, R. 1998. Antelope Survey Update. Number 7: January 1998.

EDROMA, E. 1994. The status of elephants in Uganda. Unpublished paper prepared for AfESG meeting, Mombasa, Kenya, 27 May - 2 June, 1994. 6pp.

EKOBO, A. 1994. Table of estimates provided at AfESG meeting, Mombasa, Kenya, 1994.

EKOBO, A. pers. comm. 1994. Fax to Ruth Chunge, 14 October 1994.

EKOBO, A. 1995. Elephants in the Lobeke forest, Cameroon. *Pachyderm* 19, 73-80.

EKOBO, A. 1997. Elephant problem in the Mungo Division, Littoral Province (Cameroon). *Pachyderm* 24,53-63.

EKOBO, A. pers. comm. 1998. Fax to Lamine Sebogo, 9 July, 1998.

ENOCK, E. pers. comm. 1998. Fax to Greg Overton. 27 April 1998.

FARM, B. pers. comm. 1995. Letter to Ruth Chunge, 23 January 1995.

FAIRHEAD, J. and LEACH, M. 1998. Reconsidering the extent of deforestation in twentieth century West Africa. *Unasylva* 192, 38-46.

FISCHER, F. pers. comm. 1998. E-mail to Greg Overton, 1 September, 1998.

FOURNIRET, Y. 1994. Recensement de la faune du Parc National de l'Akagera et du Domaine de Chasse du Mutura (Rwanda). Période de Janvier 1993 à Mars 1994. Projet Sauvegard et Maintenance des Potentialités du Parc National de l'Akagera. CCE-ORTPN-CIFCD. Unpublished Report.

GARAI, M. pers. comm. 1998a. Letter to Willy Simons, 28 April 1998.

GARAI, M. pers. comm. 1998b. Fax to Willy Simons, 30 June 1998.

GARAI, M. pers. comm. 1998c. Fax to Willy Simons, 7 July 1998.

GAWAISA, S.G. 1998. AfESG questionnaire reply, January 1998.

GEORGIADIS, N., TURKALO, A. and FAY, M. [1994]. Evolution of African forest elephants. Unpublished manuscript. 9pp.

GIBSON, D.ST.C. 1997. Aerial survey of elephants and other mammals in North Western Matabeleland. WWF, Harare, Zimbabwe. Project Paper No. 54. 131pp.

GIBSON, D.ST.C. 1998. Aerial survey of wildlife in and around Niassa Game Reserve, Mozambique, October 1998. Unpublished report. 48pp.

GRAHAM, A., ENAWGAW, C. and NETSERAB, B. 1996. Trends in large herbivores of Omo and Mago National Parks. National Parks Rehabilitation in Southern Ethiopia Project, Technical Report No. 5. 18pp.

GRAHAM, A., ENAWGAW, C. and NETSERAB, B. 1997. Trends in large animals of Omo & Mago National Parks. National Parks Rehabilitation in Southern Ethiopia Project, Technical Report No. 6. 14pp.

GRAINGER, J. pers. comm. 1994. Fax to Ruth Chunge, 22 November 1994.

GUILLET, A. 1990. Ivory smuggling in Sudan. *Swara* 13(1), 31-33.

HAGOS, Y. 1993. Wildlife reconnaisance survey in the Gash-Setit Awraja. Report prepared for the Wildlife Conservation Section, Ministry of Agriculture, Asmara, Eritrea. October 1993. Unpublished report.

HALL, J.S., INOGWABINI, B., WILLIAMSON, E.A., OMARI, I., SIKUBWABO, C. and WHITE, J.T. 1997. A survey of elephant (*Loxodonta africana*) in the Kahuzi-Biega National Park lowland sector and adjacent forest in eastern Zaire. *African Journal of Ecology* 35, 213-223.

HALL-MARTIN, A.J. and PIENAAR, D.J. 1992. A note on the elephants of southeast Angola. Report to AERSG meeting, Gaborone, July 1991.

HART, J.A. and SIKUBWABO, C. 1994. Elephant. In: "Exploration of the Maiko National Park of Zaire 1989-1992: history, environment and the distribution and status of large mammals". Wildlife Conservation Society, New York. Working Paper No. 2, June 1994. p34-41.

HART, J.A. pers. comm. 1998. E-mail to Greg Overton, 25 August 1998.

HASHIM, I. pers. comm. 1998. Letter to Greg Overton. 16 April 1998.

HENSHAW, J. 1997. In litt. to Antelope Survey Report, 1997.

HILLMAN SMITH, K. 1998. The current status of the northern white rhino in Garamba. *Pachyderm* 25, 104 - 105.

HILLMAN SMITH, K. 1998. AfESG questionnaire reply, 1998.

HÖFT, R. and HÖFT, M. 1993. The differential effects of elephants on rain forest communities in the Shimba Hills, Kenya. *Biological Conservation* 73, 67-79.

HOPPE-DOMINIK, B. 1998. Introduction d'un systeme de suivi écologique pour l'evaluation amelioree des activites du project dans le Parc National de Taï. Deutsche Gesellschaft für Technische Zusammenarbeit. Project no.:97.2038.4.

HURST, B. 1994. AfESG questionnaire reply, March 1994.

IUCN/SSC African Elephant Specialist Group Taskforce. Unpublished final report. October 1993. 15pp.

JACHMANN, H. 1991. Current status of the Gourma elephants in Mali: a proposal for an integrated resource management project. International Union for Conservation and Natural Resources. March 1991. 36pp.

JACHMANN, H. 1992. Movements of elephants in and around Nazinga Game Ranch, Burkina Faso. *Journal of African Zoology.* 106,27-37.

JACHMANN, H. and KALYOCHA, G. 1994. Surveys of large mammals in 9 conservation areas of the Central Luangwa Valley. Luangwa Integrated Resource Development Project. P.O. Box 510249, Chipata, Zambia. Project Document No. 19. 19pp.

JACHMANN, H. 1996. Aerial survey of the Luangwa Valley; animal abundance and population trends. Luangwa Integrated Resource Development Project. Unpublished report. 19pp.

JOFCA (JAPAN OVERSEAS FORESTRY CONSULTANTS ASSOCIATION) 1997. Final report of the master plan study on sustainable multiple-use resource management of Nkhotakota Wildlife Reserve, Malawi (data). Japan International Cooperation Agency / Ministry of Natural Resources, Republic of Malawi.

KANE, A. pers. comm. 1998. Fax to Greg Overton, 25 June 1998.

KANGWANA, K. 1995. Human-elephant conflict: the challenge ahead. *Pachyderm* 19, 11-14.

KANGWANA, K. 1996. African Wildlife Foundation Technical Handbook Series (7th) *Studying Elephants*. Edited by Kadzo Kangwana. AWF, Nairobi.

KNIGHT, M.H. 1998. AfESG questionnaire reply, May 1998.

KOUAME, D. 1994. AfESG questionnaire reply, May 1994.

KOUAME, D. pers. comm. 1998. Fax to Greg Overton. 9 June 1998.

KPANOU, J.B., OTTO, K., MBEA, E. GODOBO, P. and BLOM, A. 1998. Wildlife survey of the Bangassou forest. Unpublished report for WWF. 10pp.

LAHM, S. 1998. AfESG questionnaire reply, January 1998.

LAMPREY, R.H. 1994. Aerial census of wildlife of Omo and Mago National Parks, Ethiopia, July 29-August 4, 1994. August 1994. Ecosystems Consultants. Unpublished report. 31pp.

LARGEN, M.J. and YALDEN, D.W. 1987. The decline of elephant and black rhinoceros in Ethiopia. *Oryx* 21(2), 103-106.

LIMOGES, B. 1989. Résultats de l'inventaire faunique au niveau national et propositions de modifications à la loi sur la chasse. República da Guiné-Bissau Ministério do Desenvolvimento Rural e da Agricultura. CECI et UICN. December 1989.

LINDEQUE, M. and LINDEQUE, P.M. 1991. Satellite tracking of elephants in northwestern Namibia. *African Journal of Ecology* 29,196-206.

LINDEQUE, M. 1995. Conservation and management of elephants in Namibia. *Pachyderm* 19, 49-5.

LINDEQUE, M., LINDEQUE, P.M., STANDER, P.E., ERB, P., LOUTIT, R. and SCHEEPERS, J.L. 1995. Namibian elephant censuses in 1995: ELESMAP country report (draft). Ministry of Environment & Tourism, Republic of Namibia.

LINDEQUE, M. 1998. AfESG questionnaire reply, January 1998.

LINDSAY, K. 1993. Elephants and habitats: the need for clear objectives. *Pachyderm* 16, 34-40.

LITOROH, M. and MWATHE, K. 1996a. A survey of the Arabuko Sokoke Forest elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report.

LITOROH, M. and MWATHE, K. 1996b. Elephant aerial census, Lamu District. June, 1996. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 4pp.

LITOROH, M. 1997a. Elephant aerial census of south-western Eritrea and northern Ethiopia. Report to the Governments of Eritrea and Ethiopia, the African Elephant Specialist Group and USFWS. 15pp.

LITOROH, M. 1997b. Shimba elephant aerial survey (A minimum total count). Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 17pp.

LITOROH, M. 1997c. Elephant trends in numbers and distribution in coastal districts of Kwale, Kilifi, Lamu, Tana River and Garissa. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 10pp.

MACKIE, C. 1995. Aerial census of elephant and other large herbivores in the Sebungwe, Dande and Zambezi Valley Escarpment Communal Lands 1995. WWF, Harare, Zimbabwe. Project Paper No. 49. Unpublished report. 35pp.

MACKIE, C.S. and CHAFOTA, J. 1995. Aerial survey of large mammals in Magoe District (North West Tete Province) Mozambique. WWF, Harare, Zimbabwe. Project Paper No. 47. Unpublished report. 18pp.

MACKIE, C. 1997a. Aerial census of elephant and other large herbivores in the Sebungwe, Dande, Zambezi Valley Escarpment and southeast lowveld communal lands 1996. WWF, Harare, Zimbabwe. Project Paper No. 50. Unpublished report. 49pp.

MACKIE, C. 1997b. Aerial census of elephant and other large herbivores in the Sebungwe and Dande Communal Lands 1997. WWF, Harare, Zimbabwe. Project Paper No. 56. Unpublished report. 70pp.

MACKY, L.Y. 1991. EEC African Elephant Survey and Conservation Programme questionnaire reply, March 1991.

MAIGE, M. 1998. AfESG questionnaire reply. January 1998.

MANEGENE, S. and MUSOKI, J. 1998. Mwea elephant survey, 1998. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report.

MARTIN, E.B. 1998. New buyers of ivory in Sudan threaten elephants. *Oryx* 32(3), 166-169.

MASOGO, R. 1998. AfESG questionnaire reply, January 1998.

MANSPEIZER, I. 1994. Elephant conservation development programme – Ethiopia. Wildlife Conservation Society, New York. Report for submission to *European Commission DG VIII: Ecology in Developing Countries Programme*. Volume 3, November 1994. 108pp.

MAYERS, J., ANSTEY, S. and PEAL, A. (1992) Liberia. In The Conservation Atlas of Tropical Forests: Africa (ed by JA Sayer, CS Harcourt & NM Collins), pp. 214-220. Macmillan, UK.

MERZ, G. and HOPPE-DOMINIK, B. 1991. Distribution and status of the forest elephant in the Ivory Coast, West Africa. *Pachyderm* 14, 22-24.

MERZ, G. 1986. Counting elephants (*Loxodonta africana cyclotis*) in tropical rain forests with particular reference to the Tai National Park, Ivory Coast. *African Journal of Ecology* 24, 61-68.

MET (MINISTRY OF ENVIRONMENT AND TOURISM). 1997. Proposal submitted by Zimbabwe for the transfer of African elephant (*Loxodonta africanus*) from Appendix I to II. Department of National Parks and Wuild Life Management, Harare, Zimbabwe. 62pp.

MICHELMORE, F., BEARDSLEY, K., BARNES, R.F.W. and DOUGLAS-HAMILTON, I. 1994. A model illustrating the changes in forest elephant numbers caused by poaching. *African Journal of Ecology* 32, 89-99.

MICHELMORE, F. pers. comm. 1998. E-mail to Willy Simons, 16 October 1998.

MILLIKEN, T. pers. comm. 1998. E-mail to Richard Barnes.

MILNER-GULLAND, E.J. and BEDDINGTON, J.R. 1993a. The exploitation of elephants for the ivory trade: an historical perspective. *Proc. R. Soc. Lond.* B. 252,29-37.

MILNER-GULLAND, E.J. and BEDDINGTON, J.R. 1993b. The relative effects of hunting and habitat destruction on elephant population dynamics over time. *Pachyderm* 17, 75-90.

MINISTERE DE L'AGRICULTURE DES EAUX ET FORETS, REPUBLIQUE DE GUINEE. 1998. Réunion de Groupe de Specialistes de l'éléphant d'Afrique (GSEA). Document de Travail. Janvier 1998. Unpublished report. 3pp.

MKANDA, F.X. 1992. The effects of inadequate fencing along the astern boundary of Kasungu National Park. *Nyala* 15: 63-68.

MKANDA, F.X. 1993. Aerial count in northern and central region conservation areas – November 1992, Dept. of National Parks and Wildlife, Unpublished report Ref.No. 7/88A, 29pp.

MKANDA, F.X. 1993. AfESG questionnaire reply, October 1993.

MOSS, C. pers. comm. 1998. E-mail to Willy Simons, 10 August 1998.

MPALA RESEARCH CENTRE. 1996. Numbers and distribution of wild herbivores in Laikipia District. Unpublished report. 21pp.

MSHELBWALA, J.H. 1998. Unpublished report provided at AfESG meeting in Ouagadougou, Burkina Faso, 1998. 27pp.

MTWA (MINISTRY OF TOURISM, WILDLIFE AND ANTIQUITIES). 1996a. A survey of the wildlife protected areas of Uganda. Phase I. September 1995 – January 1996. Unpublished report. 174pp.

MTWA (MINISTRY OF TOURISM, WILDLIFE AND ANTIQUITIES). 1996b. A Survey of Wildlife Protected Areas of Uganda, Mimeo. Phase II. April – June 1996. Unpublished report. 82pp.

MUBALAMA, L.K. 1998. Conservation status and distribution of African elephants *Loxodonta africana* in Central Sector of the Parc National des Virunga: report of a field reconnaissance and initiation of a monitoring programme. Democratic Republic of Congo. August 1998. Unpublished report. 27pp.

MULAMA, M., SAKWA, J.and BITOK, E.K. 1996. A survey of the Mount Elgon Forest. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 15pp.

MUNTHALI, S. pers. comm. 1998. Fax to Greg Overton, 19 August 1998.

MURIUKI, G. and MULAMA, M. 1997. A dry total count of elephant, buffalo and key livestock in the Masai Mara National Reserve and the adjacent areas. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 14pp.

MURIUKI, G., NDETEI, R., OPIYO, M., and OMONDI, P. 1997. Total elephant count & other large herbivores in the Nasolot, S. Turkana, Kamnarok and Rimoi National Reserves. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 11pp.

MURIUKI, G., OUMA, B.O. and OMONDI, P. 1998a. Elephant, buffalo and key livestock wet season aerial count in the Masai Mara National Reserve and the adjacent area. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 14pp.

MURIUKI, G., OUMA, B.O. and OMONDI, P. 1998b. Elephant, buffalo and key livestock dry season aerial count in the Masai Mara National Reserve and the adjacent area. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 10pp.

MWATHE, K. 1998. Aerial wildlife count of Meru/Bisanadi, Kora, Mwingi and the northern dispersal area. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 24pp.

MWIYA, S. 1996. A survey of large mammals in Sioma-Ngwezi National Park, Zambia. National Parks and Wildlife, Zambia. Unpublished report. 4pp.

N'DIKIBAYE, D. AfESG questionnaire reply. June 1998

NDUNGURU, I. 1998. AfESG questionnaire reply. April 1998.

NGANGA, I. 1998. Rapport bilan de l'inventaire des grandes mammiferes diurnes realise au ranch de Nazinga du 25 au 29 mars 1998. Nazinga, Burkina Faso. Unpublished report. 55pp.

NIAGATE, B. 1998. AfESG questionnaire reply, July 1998.

NJUMBI, S., MWATHE, K., GACHAGO, S., MUNGAI, P. and WAITHAKA, J. 1995. A survey of the Mau forest complex elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 34pp.

NORTON-GRIFFITHS, M. 1978. *Counting Animals* Handbook No.1. African Wildlife Foundation, Nairobi.

NRCC (Natural Resources Conservation Council). 1991. Elephant conservation plan for Nigeria. Federal Ministry of Agriculture and Water Resources, Abuja, Nigeria. Unpublished report. 79pp.

N'SOSSO, D. 1994. Conservation et problèmatique de gestion de l'éléphant au Congo. Report to AfESG meeting, Mombasa, May 1994.

N'SOSSO, D. 1995. Revised elephant estimates sent to Ruth Chunge, August 1995.

OATES, J. pers.comm. 1998. E-mail to Richard Barnes. 10 November 1998.

OBOT, E., EDET, C., OGAR, G. and AYUK, J. 1998. A population survey of elephants (*Loxodonta africana cyclotis*) in Okwangwo Division of Cross River National Park Nigeria. Unpublished report. 9pp.

OKOUMASSOU, K. 1998. AfESG questionnaire reply, January 1998.

OKOUMASSOU, K. BARNES, R.F.W. and SAM, M.K. 1998. The distribution of elephants in northeastern Ghana and northern Togo. *Pachyderm* 26, 52-60.

OLIVIER, R.C.D. 1992. Uganda National Parks. Technical Assistance to the Uganda Institute of Ecology. Commission of the European Communities EDF Project 6100.037.42.031. Final Report. Agriconsulting. November 1992.

OMONDI, P. pers. comm. 1998. Verbal information given to Willy Simons.

OMONDI, P, WAITHAKA, J. and BITOK, E.K. 1998a. Elephant habitat interaction study in Mt. Kenya Forest. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 11pp.

OMONDI, P., WAITHAKA, J. and BITOK, E.K. 1998b. A survey of Shimba Hills National Reserve and Mwaluganje Sanctuary elephant populations. June 1998. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 11pp.

ORPTN (OFFICE RWANDAIS DU TOURISME ET PARCS NATIONAUX) 1991. Plan de Conservation de l'Elephant en Rwanda. October 1991. ORTPN/AECCG, B.P. 905 Kigali, Rwanda.

OSBORNE, F.V. and WELFORD, L.A. 1996. Living with elephants: a manual for wildlife managers in the SADC region. 95pp.

PARKER, I.S.C. 1979. The ivory trade. Unpublished report to I. Douglas-Hamilton on behalf of the US Fish and Wildlife Service.

PAVY, J.M. pers. comm. 1998. E-mail to Greg Overton, 16 April 1998.

PHIRI, C.M. 1996. Report on the elephant census in the Lower Zambezi National Park. National Parks and Wildlife, Zambia. Unpublished report. 4pp.

PHIRI, C.M. pers. comm. 1998. Verbal information given to Willy Simons on his trip to Zambia in 1998.

POOLE, J. and REULING, M. 1997. A survey of elephants and other wildlife of the West Kilimanjaro Basin, Tanzania. Unpublished report. 66pp.

POWELL, J.A. 1993. AfESG questionnaire reply, September 1993.

PRICE WATERHOUSE. 1995. Elephant Census Review in Zimbabwe: 1980-1995. An analysis and review. Report commissioned by Government of Zimbabwe.

PRINGLE, R.M. and DIAKITE, N. 1992. The last Sahelian elephants. *Swara* 15 (5), 24-26.

REULING, M., LITOROH, M. and SAKWA, J. 1992. A survey of the Mathews Range elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report. 30pp.

ROTH, H.H. and DOUGLAS-HAMILTON, I. 1991. Distribution and status of elephants in West Africa (1). *Mammalia*, 55, 489-527.

RUGGIERO, R.G. and FAY, M. 1994. Utilization of termitarium soils by elephants and its ecological implications. *African Journal of Ecology* 32, 222-232.

SAGNAH, S. 1998. AfESG questionnaire reply, January 1998.

SAID, M. and CHUNGE, R. 1994. *African Elephant Database*. A preliminary update: November 1994. UNEP/IUCN. 169pp.

SAID, M.Y., CHUNGE, R.N., CRAIG, G.C., THOULESS, C.R., BARNES, R.F.W. and DUBLIN, H.T. 1995. *African Elephant Database 1995*. IUCN, Gland, Switzerland. 225 pp.

SAIWANA, L. 1998. AfESG questionnaire reply, January 1998.

SAIWANA, L. pers. comm. 1998. Verbal information given to Willy Simons.

SAM M.K. 1994a. A zoological survey of Digya National Park. Mimeograph Report to Forest Resource Management Project. GWD/IUCN Project 9786. Accra.

SAM M.K. 1994b. A preliminary elephant survey of northeastern Ghana. Unpublished Report. Wildlife Department, Accra.

SAM. M.K. and WILSON V.J. 1994. A zoological survey of Kogyae Strict Nature Reserve. Mimeograph Report to Forest Resource Management Project. GWD/IUCN Project 9786. Accra.

SAM M.K. pers.comm. 1995. Fax to Ruth Chunge, 10 June, 1995.

SAM, M.K., HAIZEL, C. and BARNES, R.F.W. 1997. Crop-raiding by elephants during the 1996 harvest season in the Red Volta Valley (Upper East Region, Ghana). WWF Project Report.

SAM, M.K. 1998. AfESG questionnaire reply, January 1998.

SAM, M.K., BARNES, R.F.W. and OKOUMASSOU, K. 1998. Elephants, human ecology and environmental degradation in northeastern Ghana and northern Togo. *Pachyderm* 26, 61-68.

SARMIENTO, E.E. and BUTYNSKI, T. 1997. Preliminary report on the Tshiaberimu survey: June 28 - July 17 1997. Unpublished report. 10pp.

SCULLARD, H.H. 1974. *The Elephant in the Greek and Roman World*. Thames and Hudson, London.

SEBOGO, L. 1998. Monthly report to the African Elephant Specialist Group. 3pp.

SEBOGO, L. pers. comm. 1998. Unpublished report to Greg Overton, 10 August 1998. 4pp.

SEYDOU, S. 1996. Rapport Annuel 1996-1997. Unpublished report. 27pp.

SEYDOU, E.M. 1998. AfESG questionnaire reply, April 1998.

SHERRY, B.Y. AND TATTERSALL, F. 1996. The loss of a population of elephants in the Middle Shire Valley, southern Malawi. *Pachyderm* 22, 36-43.

SHOSHANI, J. 1993. Elephants: the super keystone species. *Swara* 16(2),25-29.

SOMMERLATTE, M. and WILLIAMSON, D. 1995. Aerial survey of the Murchison Falls National Park, the Karuma Game reserve and the Bugungu Game Reserve, April 1995. Unpublished report. 34pp.

SOURNIA, G. 1992. In: DOUGLAS-HAMILTON, I., MICHELMORE, F. and INAMDAR, A. 1992. *African Elephant Database.* United Nations Environment Programme. February 1992. 176pp.

SPINAGE, C.A. 1985. The elephants of Burkina Faso, West Africa. *Pachyderm* 5, 2-5.

SPINNEY, L. 1996. Southern Sudan. *Swara* 19(3), 28-30.

SUKUMAR, R. 1993. Minimum viable populations for elephant conservation. *Gajah* 11, 48-52.

SWANEPOEL, C.M. 1993. Baobab damage in Mana Pools. *African Journal of Ecology* 31, 220-225.

TANGHANWAYE, N.N. 1993. AfESG questionnaire reply, October 1993.

TCHAMBA, M., WANZIE, C.S., YADJI, B. and GARTLAN, S. 1991. National plan for elephant conservation. Republic of Cameroon. Ministry of Tourism.

TCHAMBA, M.N. and MAHAMAT, H. 1992. Effects of elephant browsing on the vegetation in Kalamaloue National Park, Cameroon. *Mammalia* 56(4), 533-540.

TCHAMBA, M. 1993. Number and migration patterns of savanna elephants (*Loxodonta africana africana*) in northern Cameroon. *Pachyderm* 16, 66-71.

TCHAMBA, M.N., BAUER, H., HUNIA, A., DE IONGH, H.H., and PLANTON, H. 1994. Some observations on the movements and home range of elephants in Waza National Park, Cameroon, *Mammalia* 58, 527-533.

TCHAMBA, M. pers. comm. 1995. Fax to Ruth Chunge, 23 August 1995.

TCHAMBA, M. 1995. The problem elephants of Kaélé: a challenge for elephant conservation in northern Cameroon. *Pachyderm* 19, 26-32.

TCHAMBA, M.N. and ELKAN, P. 1995. Status and trends of some large mammals and ostriches in Waza National Park, Cameroon. *Afr. J. Ecol.*, 33, 366-376.

TCHAMBA, M.N., BAUER, H., HUNIA, A., and DE IONGH, H.H. 1995. Application of VHF-radio and satellite telemetry on elephants in the extreme north Province of Cameroon, *Afr. J. Ecol.*, 335-346.

TCHAMBA, M.N., BARNES, R.F.W. AND NDJOH A NDIANG, I. 1997. National Elephant Management Plan. Ministry of Environment & Forestry and WWF, Yaoundé, Cameroon. 48pp.

TCHAMBA, M.N. pers. comm. 1998. Fax to Greg Overton, 10 August 1998.

TCHAMBA, M.N. 1998. Habitudes migratoires des éléphants et interactions homme éléphant dans la région de Waza-Logone (Nord-Cameroun). *Pachyderm* 25, 53-66.

TEHOU, A.C. 1997. Un example de conservation in situ: étude des parametres biologiques et ecologiques chez les elephants de savane dans la zone cynegetique de Djona dans le Nord-Bénin. Unpublished report. 12pp.

TEKLE, F. pers. comm. 1998. Letter to Greg Overton, 14 May, 1998.

TELLO, J. pers. comm. 1998. Fax to Greg Overton, 28 July 1998.

TEMBO, A. 1993. AfESG questionnaire reply, October 1993.

THOULESS, C. 1993. Elephant distribution in Nigeria. Unpublished consultant's report, September 1993. 5pp.

THOULESS, C. 1995a. Aerial survey for wildlife in Omo Valley, Chew Bahir and Borana Areas of Southern Ethiopia. Report to Ethiopian Wildlife Conservation Organisation. July 1995. Ecosystems Consultants. Unpublished report. 29pp.

THOULESS, C. 1995b. Aerial survey for wildlife in eastern Ethiopia. Report to Ethiopian Wildlife Conservation Organisation. September 1995. Ecosystems Consultants. Unpublished report. 30pp.

THOULESS, C. 1997. Long distance movements of elephants in northern Kenya. *African Journal of Ecology* 33, 321 - 334.

THOULESS, C. pers. comm. 1998. E-mail to Greg Overton, 12 December 1998.

THOULESS, C. 1998. Variability in ranging behaviour of elephants in northern Kenya. *Pachyderm* 25, 67-73.

TURKALO, A. and FAY, M. 1995. Studying elephants by direct observation: preliminary results from the Dzanga clearing, Central African Republic, *Pachyderm* 20, 45-54.

TURKALO, A. 1996. Studying elephants by direct observation in the Dzanga clearing, an update, *Pachyderm* 22, 59-60.

TURKALO, A. 1998. AfESG questionnaire reply, June 1998.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1992. Recent trends in Tanzanian elephant populations: 1987-1992. Frankfurt Zoological Society, Arusha, Tanzania.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1995. Aerial survey of the Selous Game Reserve, Mikumi National Park, and surrounding areas dry season 1994. Frankfurt Zoological Society, Arusha, Tanzania.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1998a. Aerial wildlife census Moyowosi-Kigosi Game Reserves wet season May 1998. TWCM/FZC/EU Wildlife survey report. Arusha, Tanzania. 27pp.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1998b. Total counts of buffalo and elephant in Tarangire Ecosystem, wet season March 1998. TWCM/FZC/EU Wildlife survey report. Arusha, Tanzania. 17pp.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1998c. Total counts of buffalo and elephant in Tarangire Ecosystem dry season September 1998. TWCM/FZC/EU Wildlife survey report. Arusha, Tanzania. 17pp.

TWCM (TANZANIA WILDLIFE CONSERVATION MONITORING). 1998d. Preliminary tables of estimates for Ugalla River, Greater Ruaha, Katavi, Burigi and Serengeti given to Willy Simons by TWCM on his visit to Tanzania in 1998.

ULG CONSULTANTS LTD. 1994a. Aerial census of animals in Botswana, dry season 1994. Report to the Department of Wildlife and National Parks, Botswana. 68pp.

ULG CONSULTANTS LTD. 1994b. Aerial census of animals in Botswana, wet season 1994. Report to the Department of Wildlife and National Parks, Botswana. Unpublished report. 39pp.

VANLEEUWE, H., GAUTIER-HION, A and CAJANI, S. 1997. Forest clearings and conservation of elephants (*Loxodontus africana cyclotis*) in north-east Congo Republic, *Pachyderm* 24 (Jul-Dec), 46-52.

WAITHAKA, J. 1997. Elephant poaching in Kenya. *Pachyderm* 24, 66.

WAITKUWAIT 1994. AfESG questionnaire reply, May 1994.

WALSH, P. pers. comm. 1998. Email to Greg Overton, 10 August 1998.

WAMUKAYO, G.M., NJAGAH, D., GACHAGO, S., KAHIHIA, A., TOO, D., KIRUI, J. and MULAMA, M. 1997. A survey of the Transmara forest elephant population. Kenya Wildlife Service, Nairobi, Kenya. Unpublished report.

WANZIE, C.S. 1993. Movements, distribution and status of Mount Cameroon elephant (*Loxodonta africana cyclotis*). Unpublished report, IRZV.

WESTERN TANZANIA ECOMONITORING PROJECT (WTEP). 1997. A rapid assessment of large mammal distribution in Biharamulo & Shinyanga, Tanzania. Unpublished report to AfESG/IUCN. May, 1997. 14pp.

WHITE, L. 1994. Biomass of rain forest mammals in thLopé Reserve, Gabon. *Journal of African Ecology.* 63, 499-512.

WHITE, L. 1998. AfESG questionnaire reply, January 1998.

WHITE, L.J. pers. comm. 1998. E-mail to Richard Barnes, 2 October 1998.

WHYTE, I. and WOOD, C.A. 1996. Census results for elephant and buffalo in the Kruger National Park in 1996. National Parks Board, South Africa. Scientific Report 20/96. 50pp.

WHYTE, I. and WOOD, C.A. 1997. Census results for elephant and buffalo in the Kruger National Park in 1997. National Parks Board, South Africa. Scientific Report.

WHYTE, I. In prep. Census results for elephant and buffalo in the Kruger National Park in 1998. National Parks Board, South Africa. Scientific Report 2/99.

WHYTE, I. and GROBLER, D. 1998. Elephant contraception research in the Kruger National Park. *Pachyderm* 25, 45-52.

WHYTE, I. pers. comm. 1998. E-mail to AED manager. 20 August, 1998.

WILLIAMS, S. pers. comm. 1998. E-mail to Greg Overton. 29 September 1998.

WINTER, P. 1997. Wildlife in War: A proposal to re-survey two protected areas in Sudan in order to devise appropriate conservation strategies with the communities around them.

WINTER, P. pers. comm. 1998. Letter to Greg Overton. Undated 1998.

WON WA MUSITI, B. 1991. EEC African Elephant Survey and Conservation Programme questionnaire reply, 1991.

WON WA MUSITI, B. pers. comm. 1998. E-mail to Greg Overton. October 1998.

WOOD, P. 1993 AfESG questionnaire reply, September 1993.

WORLD BANK. 1998. World Bank Development Report 1998/99.

YALDEN, D.W., LARGEN, M.J. and KOCK, D. 1986. Catalogue of mammals of Ethiopia 6. *Perisodactyla, Proboscidae, Hayracoidea, Lagomorpha, Tubulidentata, Sirenia and Cetacea. Monitore. Zool. Ital.* (N.S.) Suppl. XXI. 21(4), 46-76.

YOHANNES, Y. 1998. AfESG questionnaire reply, January 1998.

ZYAMBO, P. 1997. Aerial sample counts of large mammals in Kafue National Park and seven surrounding Game Management Areas. National Parks and Wildlife, Zambia. Unpublished report. 14pp.

Footnote

A substabtial proportion of the above references are stored as hard copies in the AED office located at the WWF Regional Office, Nairobi, Kenya. Efforts are being made to improve the collection, especially with regard to articles published in scientific journals and unpublished departmental reports. In some cases a report has been cited as a reference but information on, for example, the number of pages in the document, is incomplete because the report is not yet in the AED office. Most of the personal communications were e-mails or faxes and where possible, these have been kept as hard copies in the AED office, although it should be noted that some were verbal communications. The term "questionnaire reply" refers to any questionnaire fully or partially filled by a respondent and the majority are also kept in the AED office.