ANTELOPES

GLOBAL SURVEY
and
REGIONAL ACTION PLANS

PART 2.
SOUTHERN AND
SOUTH-CENTRAL AFRICA

Compiled by
R. East
Action Plan Coordinator
IUCN/SSC Antelope Specialist Group

WWF

Contents

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Cover Photo: Giant Sable *Hippotragus niger variani* (photo by Richard D. Estes).

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Foreword to Part 2

This second part of the Antelope Survey, like the first, has been brought to the point of publication through the efforts of Rod East, who has carried on the correspondence that elicited information about the antelopes of each country, compiled the information, written the drafts of each chapter and sent them back to his informants for corrections, all on his own time, while employed by New Zealand's Ministry of Agriculture and Fisheries as leader of a research team.

By volunteering to undertake this task, and sustaining an output that would be respectable for someone working at it full-time, Rod East has already accomplished a work that will stand as an enduring expression of his dedication to the cause of wildlife conservation. I would also like to express particular thanks to the World Wide Fund for Nature International for their continued financial support of the SSC Action Planning process.

Richard D. Estes, Chairman
Antelope Specialist Group

Compiler's Note and Acknowledgements

The Antelope Survey has been conducted by sending out status checksheets and Antelope Inventory Report Forms to Antelope Specialist Group members and correspondents. Completed checksheets, forms and notes on antelopes provided by contributors for particular countries formed the basis of initial drafts of the Antelope Survey country reports. The initial drafts for countries in Southern and South-central Africa were prepared between November 1985 and July 1987. These drafts were then modified as necessary by the authors (who contributed the original information). The final country reports were used to prepare a status summary/regional Action Plan for antelope conservation. This was completed in July 1987 and circulated to ASG members. Comments on that draft and new information received up to October 1987 have been incorporated into the regional Action Plan included in this volume.

The accuracy of each country report is the responsibility of the author(s). The regional Action Plan is the result of the combined efforts of ASG members with expertise on the region and antelope conservation in general. Preparation of this Action Plan has, in some cases, involved compromises between the conflicting opinions of different experts. While I have attempted to be objective and unbiased in these cases, I accept responsibility for any errors or omissions in the final Action Plan.

Information will be gratefully received from any reader who detects errors in this volume, or has more recent or detailed information on the status of any antelopes in the countries included in this account. If possible, completion of an Antelope Inventory Report Form (appendix 1) will be especially useful.

I am very grateful for the willing assistance I have received from ASG members and many others in compiling this report. I am especially grateful to the following: Dick Estes, Chairman of the ASG, for his guidance and support. Simon Stuart, for his invaluable help in preparation of the Antelope Survey for publication. The authors of the country reports, for their cooperation and prompt revision and return of manuscripts. In addition, J. L. Anderson, W.F.H. Ansell, R.H.V. Bell, I. Douglas-Hamilton, P. Dugan, R.D. Estes, J. Hanks, J.C. Hillman, B.J. Huntley, D.R. Mason, D. and M. Owens, G. Owen-Smith, C.A. Spinage, M.R. Stanley Price, W. von Richter, J.E. Williamson and V.J. Wilson provided helpful information on antelopes in particular countries and/or constructive criticism of the draft status summary/Action Plan. Additional acknowledgements are given in individual chapters. Finally, I must thank the World Wide Fund for Nature International for covering the costs of this publication, and the People's Trust for Endangered Species for providing a word-processor for this work.

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SECTION 1: INTRODUCTION

Chapter 1: Objectives, Scope and Limitations of the Antelope Survey

R.D. Estes and R. East

General Introduction to Part II of the Antelope Survey

This is the second of a projected four-part survey of African and Asian antelopes. Ten countries of southern and south-central Africa are included (Fig. 1). Although they occupy the narrow end of the hand axe-shaped continent, their combined area of 6 190 000 sq km is nearly ⅔ the size of the contiguous United States.

The region is remarkably diverse, in climate, geology, scenery, flora and fauna. It extends from 5° to 35° South, from the equatorial rain forest of Cabinda at the mouth of the Congo River through the moist savanna biome, dominated by broad-leafed, deciduous *miombo* woodland, to arid acacia savannas similar to those of East Africa, and to the coastal Namib desert. Lands within the Temperate Zone experience freezing temperatures in winter. Most of the interior is an elevated plateau above 1000 metres, for the most part rather featureless and monotonous, especially the *miombo* woodland and the Kalahari bushveld. But there are extensive highlands between 2000 and 3000 metres, spectacular gorges created by faulting and erosion, great swamps, lakes and pans, and a broad coastal plain in southern Mozambique, backed by Lowveld extending inland along the river valleys.

Southern and South-central Africa boasts some of the continent's finest game country, especially the floodplains bordering major rivers, lakes, swamps, and pans: the Luangwa Valley, Lake Bangweulu, the Chobe, Zambezi, Cuando, Okavango, Limpopo, and Save Rivers, Makgadikgadi Pans and Etosha Pan; also the eastern coastal plain and Lowveld, and the temperate grasslands and steppe of the South African Highveld and Karoo.

Unfortunately the time when great herds of game had free run of these places is long gone. It happened here as it has almost everywhere else, when mankind changed from hunting and gathering of wild foods to agriculture and husbandry and finally to industrialization, wildlife and other natural resources were squandered and gradually crowded out by rapidly increasing human populations.

The great herds of the Highveld and Karoo were the first to go, in the last century, as Europeans expanded into the interior, and some engaged (like American bison hunters) in the wholesale slaughter of the seemingly inexhaustible hoofed animals, followed by fencing of the range. In Namibia, appropriation of open range for ranching and farming caused drastic reduction of wildlife by the middle of this century. Then in Botswana, which until the 1960s had migratory antelope populations comparable to any in East Africa, efforts to develop the cattle industry, largely subsidized by the European Economic Community, resulted in the erection of hundreds of miles of game-proof fencing that blocked migration routes and water sources vital to the survival of water-dependent wildlife such as wildebeest and zebra during recurrent drought. In colonial times and after, millions of dollars were spent in Zambia and Zimbabwe to eradicate tsetse flies by shooting untold thousands of wild animals. Although shooting has since been abandoned as ineffective, attempts to eradicate tsetse continue: the most ambitious recent project has been to open parts of the Okavango Swamp for cattle by aerial spraying of pesticides. Construction of dams for hydroelectric power caused or contributed to the decline of highly productive ecosystems on the Kafue (Kafue Flats and Ithezi-Tezhi dams) and Zambezi (Kariba and Cabora Bassa dams), to mention only two rivers.

What is left of the wildlife in this part of Africa is now closely confined in most regions to islands where the animals and their habitat have been protected, notably to parks such as Luangwa, Kafue, Lochinvar, Hwange, Gonarezhou, Chobe, Kalahari Gemsbok, Gorongosa, Kruger, Hluhluwe-Umfolozi, Namib-Naukluft, Etosha, Iona, and Kisama. When all the wildlife reserves are added to all the parks, the total is a very substantial wildlife estate, with nearly every major ecosystem represented. Unfortunately it does not follow that all the flora and fauna are safe inside, nor that the parts of the ecosystems that have been saved are large enough to be viable. Poaching pressure has increased tremendously in recent years, especially in the developing countries that have suffered the greatest economic hardship. In Angola and Mozambique the breakdown of authority stemming from years of civil war has enabled poachers to operate freely inside the parks and reserves, to the point where there is serious concern over the ability of various common large mammals to survive.

South Africa, Namibia, and Zimbabwe have the highest standards of wildlife protection and management in Africa. The wildlife in these countries is so well protected that a considerable surplus is produced which has to be harvested or translocated to prevent habitat degradation. The economic value of game animals for trophy hunting, meat and hides, perhaps often combined with nostalgia for what was lost during development, has led to the widespread restocking of lands from which wildlife had been extirpated. However, the fact that virtually every park in South Africa, and also huge Etosha National Park is completely surrounded with a fence underscores the reality that these are islands out of and into which the animals cannot disperse readily. Furthermore, erection of the game fences often meant excluding much of the range of the migratory game such as wildebeest, gemsbok, springbok, zebra, and elephant, resulting in sharply reduced populations of these species.

Undertaking a survey of the antelopes of southern and south-central Africa, then, is to assess the fragmented remains of the unsurpassed animal kingdom described by Burchell, Gordon-Cummings, Livingstone, Selous, et al. And what is left of this wildlife estate, although already mostly inside national parks and game reserves, can only be considered safe as long as these places are effectively protected and managed. Even in Namibia and South Africa, where wildlife protection, research, and management are about on a par with the most developed nations, the future of wildlife conservation is clouded by uncertainty, as internal and external pressures for political change continue to build.

At the same time, there are hopeful signs in other countries of the region, notably Zimbabwe, Zambia, and Botswana, that government planners are beginning to recognize the vital importance of linking development with conservation. The Botswana Government has recently passed legislation designed to protect and

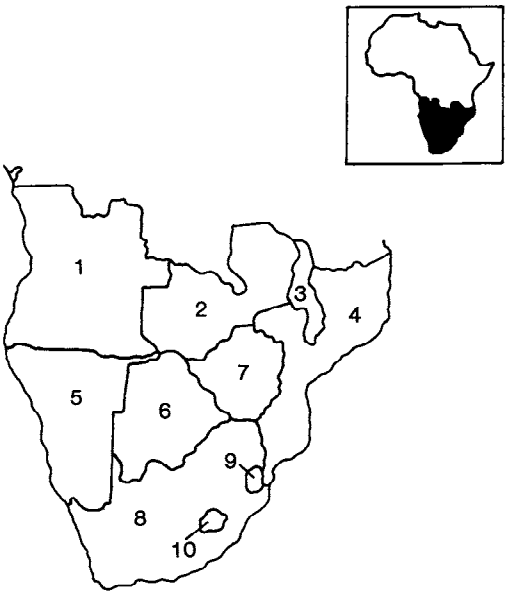

Fig. 1. Countries of Southern and South-central Africa included in part 2 of the Antelope Survey. 1: Angola. 2: Zambia. 3: Malawi. 4: Mozambique. 5: Namibia. 6: Botswana. 7: Zimbabwe. 8: South Africa. 9: Swaziland. 10: Lesotho.

restore the areas reserved for wildlife. Zambia has adopted and other countries are preparing National Conservation Strategies, in which sustainable utilization of wildlife for tourism, hunting, and meat production is accorded high priority.

Despite the long history of environmental degradation at the hand of man, experience has shown that, as long as wildlife habitat and minimum viable populations remain, most ecosystems are capable of recovering in remarkably short order, given the opportunity and favorable conditions. In this part of Africa as elsewhere, the long-term survival of viable populations of antelopes and other wildlife depends upon:

(1) adequate protection and management of natural habitats in conservation areas, including large national parks and reserves in areas of exceptional abundance and high species diversity, and smaller reserves where necessary for antelopes with localised distributions;
(2) development of forms of land use which enable human and wildlife populations to co-exist to the greatest degree possible, e.g., in buffer zones surrounding strictly protected conservation areas, and over more extensive areas where the predominant form of land use (e.g., pastoralism) is not inimical to the existence of large wild animals;
(3) greater public awareness of the need for and value of wildlife conservation, including establishment at the local level of wildlife utilisation schemes which allow rural populations to benefit materially from conservation.

Objective

A suggested goal for international antelope conservation policy is "to ensure the long-term survival of all antelope species by maintaining as many viable populations as possible of each species in as wide a range of its habitats as is practical" (modified after Parker's (1984) definition of the goal of elephant conservation in Africa). Key words in this goal are "possible" and "practical"; to succeed, antelope conservation must not be an end in itself, but part of an overall environmental conservation strategy which takes full account of, and is integrated with, human development needs.

The most immediate constraint to the attainment of this objective is the severely limited financial resources available for wildlife conservation in most African countries (Cumming et al. 1984; Parker 1984; Bell & Clarke 1986). Shortage of land for conservation is also a serious constraint in many countries. These constraints are unlikely to lessen, given Africa's rapid human population growth, poverty, and in some areas political turbulence. It is therefore necessary to draw up an order of priority for international assistance to conservation action in Africa.

As a scientific advisory group, the most appropriate action of the Antelope Specialist Group to assist the attainment of this goal was considered to be the establishment of the Antelope Survey. The objectives of this survey are to determine the current distribution, abundance, and conservation status of antelopes, identify species and areas for which knowledge is seriously inadequate, and identify antelopes whose survival is threatened. As an integral part of the survey, the information gathered is used to establish priorities for international conservation action. This includes preparation of regional Action Plans for antelope conservation.

Scope of the Antelope Survey

This survey is concerned solely with antelopes. Integration of the results of the Antelope Survey and Action Plans with those prepared for other taxa by different SSC Specialist Groups (e.g., Cumming & Jackson 1984; Oates 1986) will be necessary for the establishment of overall conservation priorities.

The classification of the region's antelopes adopted for the Antelope Survey is given in Chapter 2. Section 2 (chapters 3–12) contains a report on each of the ten countries included in the Southern and South-central African region (Fig. 1). Section 3 includes a summary of the status of antelopes within the region, identifies conservation priorities, and outlines a regional Action Plan for antelope conservation.

The reports on individual countries (section 2) have been prepared according to a standard format:

(1) A brief introduction to the country.
(2) An overview of the country's antelope fauna and its current conservation status, including a tabulation of the authors' assessments of species known to occur (at present or formerly) within the country. These status assessments are based on Red Data Book categories, with the definitions modified slightly to meet the requirements of the Antelope Survey (note that the definitions apply to the status within each country, not to the overall (global) status of each species):
   extinct: no longer occurs in the wild;
   endangered: in danger of extinction and unlikely to survive if the causal factors continue operating;
   vulnerable: declining and likely to move into the endangered category in the near future if the causal factors continue operating;
   rare: population small, not endangered or vulnerable at present, but at risk;
   indeterminate: known to be endangered, vulnerable, or rare, but not enough information available to determine which of these categories is appropriate;
   satisfactory: survival not threatened; this category often includes species whose total population in the country may be declining, but which are well represented by viable, stable or increasing populations within conservation areas;
   insufficiently known: lack of information precludes an assessment of status.
   (The summary of the regional status of antelopes in section 3 is based on quantitative, rather than qualitative, criteria. The quantitatively defined regional status categories, viz., *endangered, rare, threatened,* and *not threatened/satisfactory* are

defined in chapter 13 and are italicised to distinguish them from the Red Data Book categories above).

(3) A brief overview of conservation measures taken to protect antelope populations, with emphasis on the establishment of conservation areas.

(4) An outline of conservation measures proposed.

(5) Accounts of individual species, including distribution (with a map for each species, except for countries where antelopes are now largely restricted to conservation areas and/or private farmland—this applies to Malawi, South Africa, Swaziland and Lesotho among the countries covered in this volume), population (estimates of the total population in the country and whether numbers are increasing, stable, or decreasing are included where available), status (based on the above Red Data Book categories), and conservation measures taken (emphasising occurrence within conservation areas and, where available, estimates of populations and population trend within conservation areas). For countries where detailed species inventory reports (appendix 1) are available and there is little or no published data on antelope ecology and behaviour, a brief summary of information on each species' habitat, food and reproduction is also included—this applies to Malawi and Botswana (some species only) in this volume.

Limitations of the Antelope Survey

The value of the Antelope Survey is restricted by the accuracy and extent of the available information. While every attempt has been made to obtain as much up-to-date information as possible, many gaps remain in our knowledge of antelope distribution, abundance and conservation status, as acknowledged in the country reports and in section 3. The rapidity of events in Africa which influence antelope populations will inevitably make some parts of the survey results out of date in the near future. Nevertheless, sufficient information on the current status of antelopes in each country has been gathered by experienced and knowledgeable observers (chapters 3–12) to allow at least a broad overview of the regional status of each species (chapter 13).

As much quantitative data as possible on antelope populations are included in the species accounts in chapters 3–12, to provide a baseline for future comparisons. Where the sources of population estimates are unreferenced, they have arisen from the authors' research or observations. This information on antelope populations is used to assess regional status in chapter 13, but we strongly emphasize that all population estimates must be interpreted with great caution. Many antelopes, e.g., woodland species, are difficult to count accurately from both the air and the ground because some individuals are usually obscured by vegetation. Many of the smaller species are cryptically coloured and secretive, increasing the difficulty of achieving accurate counts within sample areas. In addition to these sources of bias, most antelope population estimates have large statistical sampling errors and wide confidence intervals, such as estimates derived from low-intensity aerial surveys. Because of these limitations, population estimates generally allow the reliable detection of only large-scale changes in numbers between sampling occasions.

The identification of key species, antelope communities, and areas for conservation action (chapters 13 and 14), and the regional Action Plan (chapter 15) identify the most important action required to maintain the diversity of antelopes on a region-wide basis. It is beyond the scope of the Antelope Survey (and would exceed the role of IUCN/SSC Specialist Groups) to prepare detailed, area-specific plans for conservation action. Such plans may range from brief outlines of the factors influencing conservation areas and key antelope populations/communities, with suggested interim solutions, to detailed management plans based on in-depth analyses of the socio-economic and biological factors involved. Preparation of detailed, specific conservation plans is properly the role of national conservation agencies, with or without assistance from international agencies. The Antelope Survey and regional Action Plans identify key areas where international assistance to antelope conservation should receive high priority.

References

Bell, R.H.V.; Clarke, J.E. 1986. Funding and financial control. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 543–555. Washington DC, US Peace Corps.

Cumming, D.H.M.; Jackson, P. (Editors). 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 at Hwange Safari Lodge, Zimbabwe, 30 July–7 August 1981. Gland, IUCN.

Cumming, D.H.M.; Martin, R.B.; Taylor, R.D. 1984. Questionnaire survey on the management and conservation of elephant and rhino. *In* Cumming, D.H.M.; Jackson, P. (Editors). The status and conservation of Africa's elephants and rhinos, pp. 46–62. Gland, IUCN.

Oates, J. (Compiler). 1986. IUCN/SSC Primate Specialist Group action plan for African primate conservation: 1986–90. Gland, IUCN.

Parker, I.S.C. 1984. Conservation of the African elephant. *In* Cumming, D.H.M.; Jackson, P. (Editors). The status and conservation of Africa's elephants and rhinos, pp. 69–77. Gland, IUCN.

Chapter 2: Classification of Antelopes Adopted for the Antelope Survey

R. East, P. Grubb and V.J. Wilson

Antelope Species

The species is the taxonomic unit of the Antelope Survey. Thirty-six species are recognized as occurring in the ten countries included in the Southern and South-central African region:

Family Bovidae	
Subfamily Bovinae	
Tribe Tragelaphini	
Tragelaphus scriptus (Pallas 1766)	Bushbuck
Tragelaphus spekii P.L. Sclater 1864	Sitatunga
Tragelaphus strepsiceros (Pallas 1766)	Greater Kudu
Tragelaphus angasii Gray 1849	Nyala
Tragelaphus oryx (Pallas 1766)	Common Eland
Subfamily Cephalophinae	
Cephalophus monticola (Thunberg 1789)	Blue Duiker
Cephalophus natalensis A. Smith 1834	Natal Red Duiker

Cephalophus nigrifrons Gray 1871	Black-fronted Duiker
Cephalophus dorsalis Gray 1846	Bay Duiker
Cephalophus silvicultor (Afzelius 1815)	Yellow-backed Duiker
Sylvicapra grimmia (Linnaeus 1758)	Grey Duiker
Subfamily Reduncinae	
Redunca arundinum (Boddaert 1785)	Southern Reedbuck
Redunca fulvorufula (Afzelius 1815)	Mountain Reedbuck
Kobus ellipsiprymnus (Ogilby 1833)	Waterbuck
Kobus vardoni (Livingstone 1857)	Puku
Kobus leche Gray 1850	Lechwe
Subfamily Hippotraginae	
Hippotragus leucophaeus (Pallas 1767)	Bluebuck
Hippotragus equinus (Desmarest 1804)	Roan
Hippotragus niger (Harris 1838)	Sable
Oryx gazella (Linnaeus 1758)	Gemsbok/Beisa Oryx
Subfamily Alcelaphinae	
Alcelaphus buselaphus (Pallas 1766)	Common Hartebeest
Alcelaphus lichtensteinii (Peters 1852)	Lichtenstein's Hartebeest
Damaliscus dorcas (Pallas 1766)	Bontebok/Blesbok
Damaliscus lunatus (Burchell 1824)	Tsessebe/Topi
Connochaetes taurinus (Burchell 1823)	Blue Wildebeest
Connochaetes gnou (Zimmermann 1780)	Black Wildebeest
Subfamily Aepycerotinae	
Aepyceros melampus (Lichtenstein 1812)	Impala
Subfamily Antilopinae	
Tribe Antilopini	
Antidorcas marsupialis (Zimmermann 1780)	Springbok
Tribe Neotragini	
Neotragus moschatus (Von Dueben 1846)	Suni
Raphicerus melanotis (Thunberg 1811)	Cape Grysbok
Raphicerus sharpei Thomas 1897	Sharpe's Grysbok
Raphicerus campestris (Thunberg 1811)	Steenbok
Madoqua kirkii (Gunther 1880)	Kirk's (Damaraland) Dikdik
Ourebia ourebi (Zimmermann 1783)	Oribi
Oreotragus oreotragus (Zimmermann 1783)	Klipspringer
Subfamily Pelеinae	
Pelea capreolus (Forster 1790)	Grey Rhebok

The list of species adopted for the Antelope Survey could be modified in various ways, but is considered to be adequate for the purposes of the survey (see East et al. 1988). The arrangement of tribes and subfamilies is based on Ansell (1972).

Antelope Subspecies

The only subspecies included in the Antelope Survey are those which are of special conservation interest because they are sufficiently distinctive morphologically, behaviourally and/or geographically to be recognised as distinct by wildlife managers in the field. Such subspecies in Southern and South-central Africa include:

Kobus ellipsiprymnus ellipsiprymnus	Common/Ringed Waterbuck
Kobus ellipsiprymnus defassa	Defassa Waterbuck
Kobus leche leche	Red Lechwe
Kobus leche kafuensis	Kafue Lechwe
Kobus leche smithemani	Black Lechwe
Kobus leche robertsi	Roberts' Lechwe
Hippotragus niger variani	Giant Sable
Oryx gazella gazella	Gemsbok
Alcelaphus buselaphus caama	Red Hartebeest
Damaliscus dorcas dorcas	Bontebok
Damaliscus dorcas phillipsi	Blesbok
Damaliscus lunatus lunatus	Tsessebe
Connochaetes taurinus taurinus	Blue Wildebeest
Connochaetes taurinus cooksoni	Cookson's Wildebeest
Connochaetes taurinus johnstoni	Nyassa Wildebeest
Aepyceros melampus petersi	Black-faced Impala

The subspecies *O. g. gazella, A. b. caama* and *D. l. lunatus* represent the entire regional populations of these three species. Some other subspecies could also justify inclusion, e.g., the southern African mountain reedbuck (*R. f. fulvorufula*) is distinct from the East African (*R. f. chanleri*) and Cameroun (*R. f. adamauae*) forms of this species.

References

Ansell, W.F.H. 1972. Order Artiodactyla. Part 15 of Meester, A.; Setzer, H. (Editors). The mammals of Africa: an identification manual. Washington DC, The Smithsonian Institution.

East, R.; Grubb, P.; Wilson, V.J. 1988. Classification of antelopes adopted for the antelope survey. *In* East, R. (Compiler). Antelopes: global survey and regional action plans. Part 1: East & Northeast Africa, pp. 3–4. Gland, IUCN.

SECTION 2: COUNTRY REPORTS

Chapter 3: Angola

R.D. Estes

Introduction

Angola is comprised mainly of broad, rolling plateaux at altitudes of 1000 to 1500 m, bordered on the west by an escarpment which overlooks a narrow strip of coastal lowland. Mean annual rainfall varies from >1400 mm in the northeast to <200 mm in the southwest. *Brachystegia/Julbernardia* (miombo) woodland covers most of the interior plateaux, with patches of rain forest in the north (Fig. 1). In the lower rainfall zone of the south, miombo is replaced by mopane (*Colophospermum mopane*) woodland, thorn scrub (*Acacia* spp., *Sclerocarya caffra*) savanna and grassy plains. There is a strip of coastal desert in the extreme southwest, extending to north of Mocamedes. This wide variety of habitats supports a diverse fauna and flora, including unique forms such as the spectacular giant sable antelope, symbol of wildlife conservation in Angola and the emblem of the IUCN/SSC Antelope Specialist Group.

The history of wildlife conservation in Angola up to the mid-1970s was outlined by Huntley (1976). Thoughtless destruction of wildlife occurred widely and with little restraint throughout almost 500 years of Portuguese colonial rule. Conservation received almost no attention until the 1930s, when the first national parks and reserves were proclaimed, and remained a very low priority until the early 1970s. By then, virtually every species of large mammal was threatened outside the parks and reserves, even though much of Angola has a sparse human population.

During the period 1971–75, when B.J. Huntley served as ecologist with the Servicos de Veterinaria of Angola, considerable progress was made, including a thorough review of the status of the national parks and reserves and a partially completed overhaul of the management of these areas. Angola's attainment of independence and the installation of the Transition Government in 1975 was followed by a brief period when, for the first time in the country's history, the importance of wildlife conservation was recognised at a senior government level. This hopeful situation deteriorated with the rapid collapse of the Transition Government and subsequent civil war.

Continuing armed conflict and widespread lawlessness affect large regions of the country, and there is very little information about the current status of wildlife in these areas. This account of Angola's antelopes is based on information obtained during the author's study of the giant sable in 1969–70 and a 3-week return visit in 1982 (Estes 1982), the surveys conducted by Huntley in 1971–75, and information provided by F. Horsten, who served as Counselor to the Direccao Nacional da Conservacao da Natureza in Luanda from 1977 to 1983.

Status of Antelopes

Antelope species which were formerly widespread in the extensive miombo woodlands of the Angolan plateau (Fig. 1) include bushbuck, eland, grey duiker, southern reedbuck, roan and oribi, with other species such as wildebeest, tsessebe, sable, sitatunga, waterbuck, lechwe and puku occurring locally in suitable habitat. Blue duiker occurred widely in forests and thickets, with three other species of forest duikers in the northern rain forest. Characteristic species of the southern mopane savanna, *Baikiaea* woodland, thorn scrub savanna and grassy plains include eland, greater kudu, wildebeest and steenbok. Gemsbok, Kirk's dikdik and springbok occur in the semi-arid and arid southwest.

Over half of the 26 species of antelopes known to occur in Angola are now endangered, vulnerable, or rare (Table 1). The status of some species has undoubtedly deteriorated since Huntley's assessment in 1975. Roan and gemsbok, for example, were regarded as "safe" in 1975 because of conservation measures and population status (Bothma 1975), but the status of these two species has since declined. Nevertheless, some antelopes apparently maintained their status despite the vicissitudes of the last decade, e.g., the giant sable (at least until 1982).

Conservation Measures Taken

Angola's proclaimed conservation areas of importance to antelope conservation include six national parks, one regional natural park, one integral natural reserve, and four partial reserves (Fig. 2). These areas protect representative examples of all of the country's major habitats for antelopes, except rain forest. Kisama National Park extends from the northern coastal zone (Fig. 1) through rolling hills to inland plateaux. It includes extensive floodplains on the Longa and Cuanza Rivers, and a mosaic of baobab and euphorbia woodland, savanna, grassy plains, and dry *Strychnos/Dichrostachys* thicket. Kangandala National Park and Luando Natural Integral Reserve comprise miombo woodland with extensive grassy "dambos" in drainage basins, and floodplains on the margins of the Cuanza and Luando Rivers. Kameia National Park contains plateau woodland and savanna, and extensive seasonally inundated grasslands. Bikuar National Park also consists mainly of miombo woodland with extensive dambos. The Bufalo Partial Reserve includes wooded savanna and dry grassland in the central subcoastal region. Mupa National Park and Mavinga Partial Reserve lie in the transition zone between miombo woodland and the *Baikiaea* and mopane woodland and savannas characteristic of the southeast. The other national parks and reserves are within the southern savanna and coastal zones. Luiana Partial Reserve contains mopane and *Baikiaea* woodland and savanna, and floodplain grassland; Iona National Park includes mopane woodland, thorn scrub and coastal desert; Mocamedes Partial Reserve contains subdesert and desert; and Chimalavera Regional Natural Park comprises *Acacia* bushland.

The long-term survival of Angola's antelopes and other large wild animals is dependent on the development of this framework of proclaimed national parks and reserves into a secure, effectively protected and managed system of conservation areas. Unfortunately, many of these parks and reserves were proclaimed by the Portuguese colonial government in complete disregard for the human populations living within them, and with little attempt to enforce conservation laws. Consequently, almost every proclaimed conservation area was suffering severe disturbances even before the eruption of civil war in the mid-1970s (Huntley 1972). Kisama, Kangandala, and Iona National Parks, and Luando Natural Integral Reserve, for example, were affected by one or more

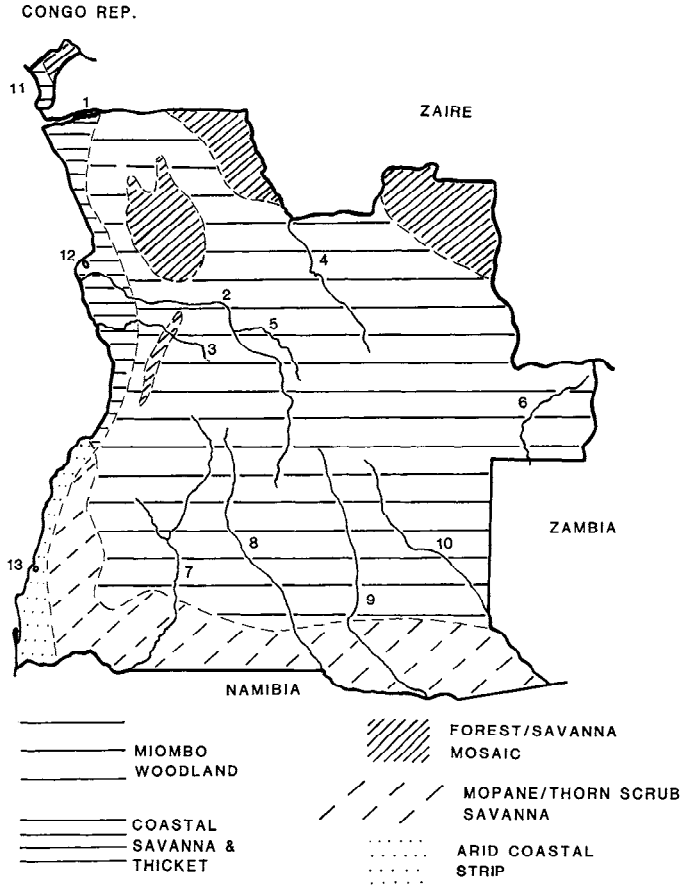

Fig. 1. Approximate major natural vegetation zones of Angola. Miombo (*Brachystegia/Julbernardia*) plateaux woodlands contain an extensive network of grassy dambos along drainage lines, with dense gallery forests along major watercourses and occasional patches of moist evergreen forest, especially towards the north. Forest-savanna mosaic comprises dense humid rainforest (especially well developed in Cabinda) and semi-deciduous forest in a mosaic with woodland and shrub savanna. Mopane (*Colophospermum mopane*)/thorn scrub savanna includes stretches of dense dry *Baikiaea plurijuga* forest, mopane and *Pterocarpus* woodland savanna, thorn scrub (*Acacia/Sclerocarya*) savanna and semi-arid grassland. Coastal savanna and thicket includes grassy plains, woodland savanna with baobabs, euphorbias and *Strychnos/Dichrostachys* thickets, and dense humid gallery forests, backed in the foothills of the escarpment by dry *Acacia* bushland. The arid coastal strip comprises sparse *Acacia* scrub and open sand dunes. 1: Zaire River. 2: Cuanza River. 3: Longa River. 4: Cuango River. 5: Luando River. 6: Zambezi River. 7: Cunene River. 8: Cubango River. 9: Cuito River. 10: Cuando River. 11: Cabinda enclave. 12: Luanda. 13: Mocamedes.

of the following: substantial resident human populations, poaching, considerable areas of subsistence agriculture, severe competition for water and grazing between wildlife and domestic livestock, and serious habitat damage from oil or diamond prospecting.

The advent of civil war in 1975 resulted in a catastrophic increase in poaching. The national parks and reserves were invaded by the various liberation armies, ranger posts overrun and the rangers' equipment looted, and wildlife slaughtered on a large scale (Huntley 1976). Intermittent armed conflict has continued for more than 10 years over considerable areas of Angola. No improvement in the national conservation situation can be expected until the conflict is finally settled. It can only be hoped that a sufficient nucleus of the country's wildlife will survive to repopulate the national parks and reserves once peace is established.

In July 1982, plans to visit Bikuar and Kameia National Parks, Chimalavera Regional Park, and Luando Reserve were abandoned because of renewed fighting with South African forces in the south and armed banditry elsewhere, but Kisama and Kangandala National Parks were visited (Estes 1982). While major problems were observed within these two parks, e.g., substantial human settlement and subsistence agriculture, and inadequate staff, equipment and authority to control poaching and other illegal activities (especially in Kisama), there were many positive signs. These included the continued existence of a national parks service (Direccao Nacional da Conservacao da Natureza), now attached to the Ministry of Agriculture, and the fact that no attempt has been made to deproclaim any conservation areas, even those with high human populations or mineral/agricultural values. In addition, continued activity by warden and game guards

Table 1
Status of Antelopes in Angola (based on assessment by B.J. Huntley in Bothma, 1975)

Species	Status*	Species	Status
Bushbuck	S	Roan	I
Common Eland	I	Sable	V
Greater Kudu	S	Gemsbok	I
Sitatunga	R	Blue Wildebeest	S
Blue Duiker	S	Red Hartebeest	En/V
Bay Duiker	R	Lichtenstein's Hartebeest	En/V
Black-fronted Duiker	R	Tsessebe	I
Yellow-backed Duiker	R	Klipspringer	S
Grey Duiker	S	Kirk's Dikdik	S
Waterbuck	En/V	Oribi	S
Red Lechwe	R	Steenbok	S
Puku	V	Impala	En/V
Southern Reedbuck	S	Springbok	S

* En = endangered; V = vulnerable; R = rare; I = indeterminate (i.e., endangered, rare, or vulnerable); S = satisfactory (not threatened). See chapter 1 for definition of status categories.

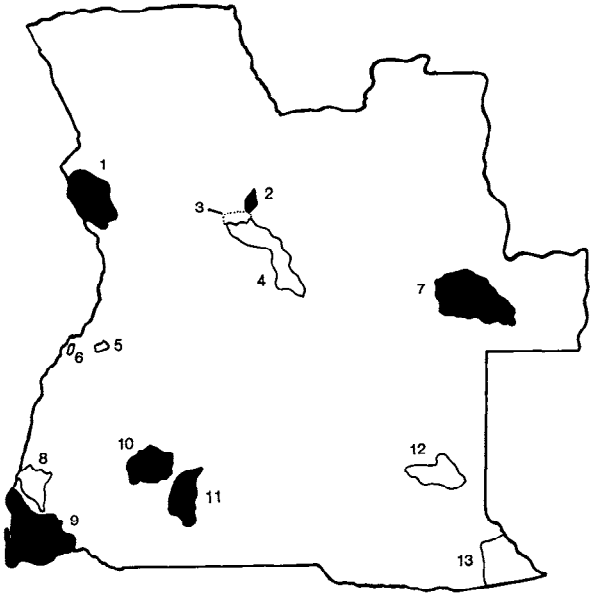

Fig. 2. Conservation areas of Angola. 1: Kisama National Park (9960 sq km). 2: Kangandala National Park (630 sq km). 3: Proposed extension to Kangandala National Park. 4: Luando Natural Integral Reserve (8280 sq km). 5: Bufalo Partial Reserve (400 sq km). 6: Chimalavera Natural Regional Park (100 sq km). 7: Kameia National Park (14 450 sq km). 8: Mocamedes Partial Reserve (4450 sq km). 9: Iona National Park (15 150 sq km). 10: Bikuar National Park (7900 sq km). 11: Mupa National Park (6600 sq km). 12: Mavinga Partial Reserve (5950 sq km). 13: Luiana Partial Reserve (8400 sq km).

in Kangandala National Park and parts of the Luando Reserve had allowed the giant sable population to maintain its numbers in these areas, despite military operations and banditry in the region.

While there is some awareness of the need for conservation in Angola among government leaders and educators, the organisation of wildlife conservation and the priority it receives from government have changed little since colonial times. What is different now is the reduced ability of wildlife officers to carry out their duties in the face of an acute shortage of vehicles and other equipment, and continuing armed strife which has forced the evacuation of several national parks and reserves. Angola urgently needs outside assistance to develop an effective conservation programme and preserve its remaining natural heritage.

Conservation Measures Proposed

Major requirements for improving the conservation situation in Angola include (Estes 1982; Huntley 1982):

(1) Appointment of a National Commission for Nature Conservation, preferably by the President of Angola, to oversee and approve a conservation master plan for the country.
(2) Appointment by the above commission of a professional parks planner/ecologist to prepare the master plan. This should include a statement of conservation objectives and priorities, specifying areas to be conserved, their intended status and use (varying as appropriate from strictly protected national parks to buffer zones or hunting blocks where activities such as subsistence hunting are permitted), and a revision of the hunting and wildlife protection laws. The plan could be based on the detailed proposals made by Huntley immediately prior to independence, with modifications as necessary due to changed circumstances.
(3) International assistance, e.g., through IUCN's various commissions, to provide technical and material aid to the development and implementation of the master plan.
(4) Revitalisation of the Directorate of Nature Conservation and its personnel into an organisation which can put the conservation master plan into practice.
(5) Revision of the curricula used in Angolan schools and Luanda University to give greater emphasis to wildlife conservation and management.
(6) A high level approach to the Government of Angola to encourage acceptance of these recommendations, and urge Angola to become a member of IUCN.

Species Accounts

In the following accounts of individual species, occurrence and populations within conservation areas are based on Huntley (1972) and Horsten (1982) except where otherwise indicated.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Formerly occurred throughout Angola, except in the arid southwest (Fig. 3). Still occurs widely. Numbers unknown, but locally common in suitable thicket/forest edge habitat.

Status: Not threatened. Its secretive habits and preference for thick cover enable it to survive long after most other antelope species are shot out.

Conservation Measures Taken: Occurs in several conservation areas, e.g., Kisama, Kangandala and Bikuar National Parks, and Luando and Bufalo Reserves.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Formerly occurred widely in the savanna woodlands (Fig. 3), but now eliminated from much of its range by overhunting. Numbers unknown, but probably reduced to low levels.

Status: Threatened by uncontrolled hunting.

Conservation Measures Taken: Common in Kisama National Park (population 3000) and Bikuar National Park in the early 1970s, but numbers now greatly reduced by poaching. Also occurs in Mupa National Park, and Luando, Mavinga, Luiana and Bufalo Reserves.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Formerly widespread in the southern mopane and thorn scrub savannas and the southern part of the miombo woodland zone (Fig. 3). Probably still occupies much of its former range away from settled areas. Numbers unknown.

Status: Able to withstand hunting pressure better than most other large antelopes because of its cryptic habits and preference for bush cover. Its survival in Angola is probably not yet threatened.

Conservation Measures Taken: Formerly common in Mavinga and Luiana Partial Reserves. Also present in Bikuar, Iona and Mupa National Parks, and Mocamedes Partial Reserve.

Sitatunga (*Tragelaphus spekii*)

Distribution & Population: Occurs locally in suitable swamp habitat in the northeast, on the Cuanza and Luando Rivers in central Angola, and marginally in the east and southeast on the Zambezi, Cuito and Cubango Rivers (Fig. 3). Numbers unknown, but probably common locally within larger, inaccessible swamp systems.

Status: Rare. The total population is unlikely to be large, but the sitatunga is highly secretive and can occur in unexpectedly large numbers close to human settlement. It can withstand intensive hunting pressure if extensive areas of its swamp habitat remain intact.

Conservation Measures Taken: Occurs in Kangandala and Kameia National Parks, and the Luando Reserve.

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Occurs locally in suitable habitat (forest, thicket, dense coastal bush) in the northern half of the country (Fig. 3). Numbers unknown, but not uncommon in some areas.

Status: Not threatened.

Conservation Measures Taken: Occurs in Kisama and Kangandala (Estes 1982) National Parks.

Bay Duiker (*Cephalophus dorsalis*), Black-fronted Duiker (*C. nigrifrons*) and Yellow-backed Duiker (*C. silvicultor*)

Distribution & Population: These three duikers occur locally in forested areas in northern Angola (Fig. 3). Numbers unknown.

Status: Classified as rare in 1975 (Bothma 1975). There is no information to suggest that the status of these three species has changed since then. In the long term they may be threatened by degradation and destruction of their forest habitats by uncontrolled logging and the encroachment of human settlement.

Conservation Measures Taken: These three duikers do not occur in any of Angola's proclaimed conservation areas.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: This species has been recorded from all regions of Angola (Fig. 3) and it remains widespread and locally common.

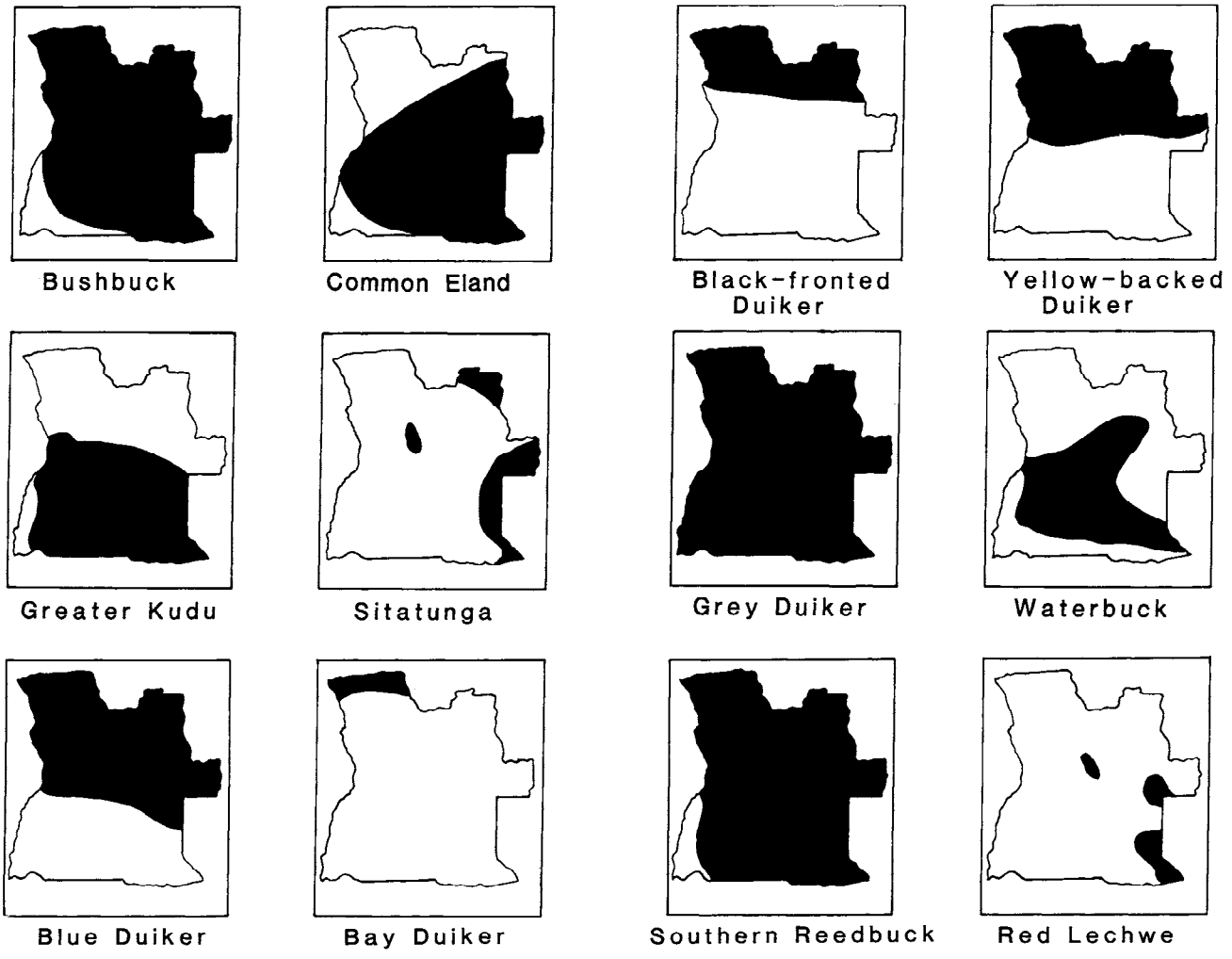

Fig. 3. Distribution of antelopes in Angola (after Dorst & Dandelot 1970; Kingdon 1982; Smithers 1983). Shaded areas represent the approximate limits of the recorded distribution of each species, not the area of continuous occurrence. The distributions of almost all species are now greatly reduced and fragmented.

Status: Satisfactory. A resilient species, able to survive close to human settlement even in the face of heavy hunting pressure.

Conservation Measures Taken: Common in Kangandala National Park, and occurs in all the other conservation areas shown in Fig. 2 except for the most arid (Iona National Park, Chimalavera Regional Park, and Mocamedes Partial Reserve).

Waterbuck (*Kobus ellipsiprymnus*)

Distribution & Population: Waterbuck of the *defassa* subspecies formerly occurred locally in Angola in grasslands and open savannas near permanent water (Fig. 3), but it has been eliminated from much of its range outside conservation areas. Numbers unknown, but the Angolan population of this species is small and declining.

Status: Threatened by poaching, and competition for grazing with domestic livestock. May have been reduced to the point where it is threatened with immediate extinction in Angola.

Conservation Measures Taken: Present (at least formerly) in small numbers in Kangandala, Bikuar and Mupa National Parks, and Luando, Mavinga and Luiana Reserves.

Lechwe (*Kobus leche*)

Distribution & Population: The red lechwe (*K. l. leche*) occurs on the floodplains of the Cuando River in the southeast, the Zambezi River in the east, and the Cuanza and Luando Rivers in central Angola (Fig. 3). Population unknown, but formerly occurred in substantial numbers within its very localised distribution.

Status: Rare. Herds of up to 200 lechwe were present on the Luando floodplain in the proposed national park extension between Kangandala National Park and the Luando Reserve (Fig. 2) in July 1982 (Estes 1982), and the species appeared to be holding its own, at least in this area, at that time.

Conservation Measures Taken: Occurs in Kameia National Park, and common in Luando (population about 2000 in the early 1970s), Mavinga and Luiana Reserves.

Puku (*Kobus vardoni*)

Distribution & Population: Occurs locally on seasonally inundated grasslands in northeastern Angola (Fig. 3). Numbers unknown, but probably declining.

Status: Threatened by uncontrolled hunting and the lack of effective conservation measures over most, if not all, of its Angolan range.

Conservation Measures Taken: Occurs in the Luando Reserve.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Formerly occurred throughout, except for the arid and semi-arid southwest (Fig. 3). Now eliminated from considerable parts of its former range, but probably still occurs more widely than most other antelope species. Numbers unknown.

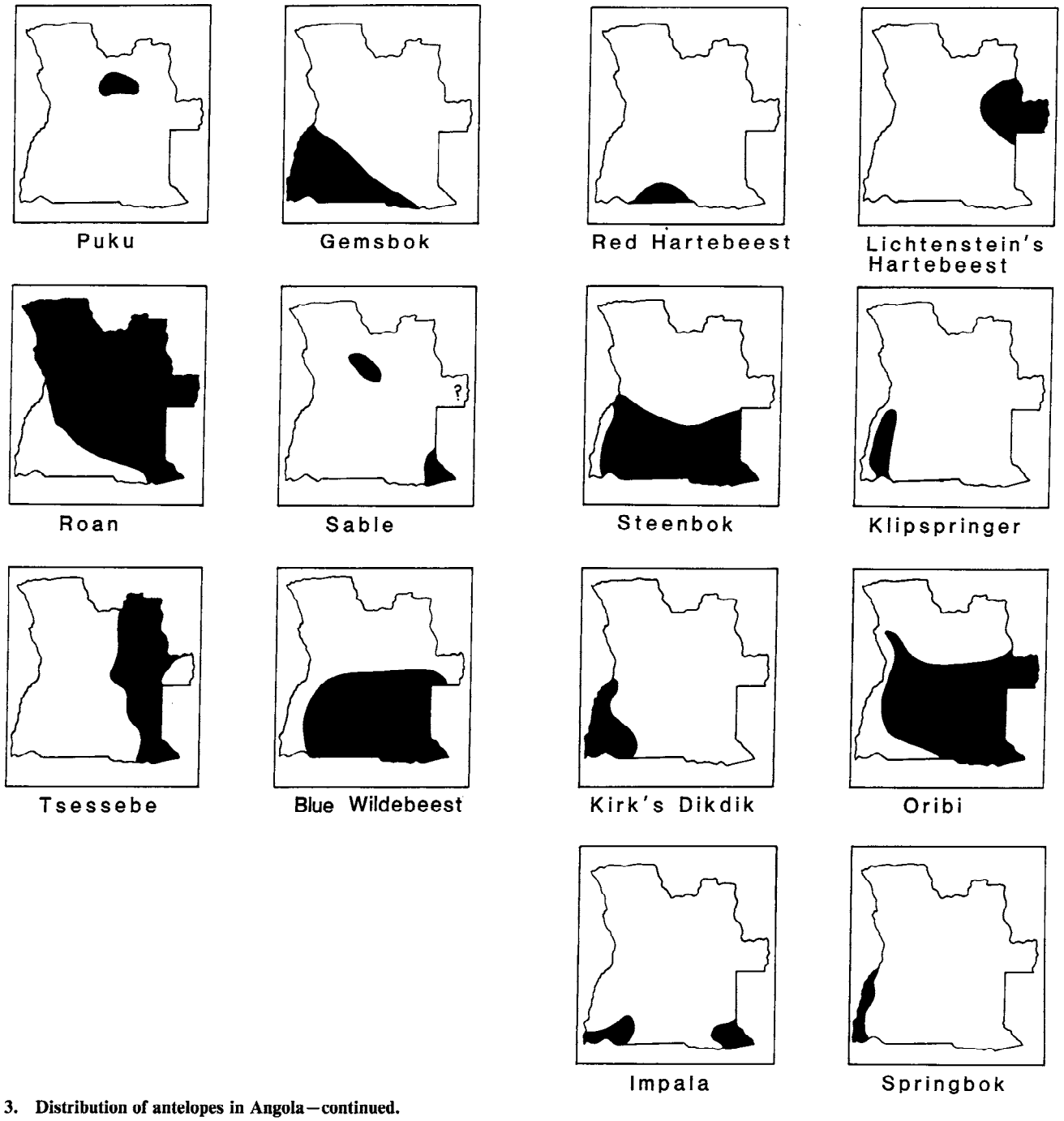

Fig. 3. Distribution of antelopes in Angola—continued.

Status: Although its numbers are undoubtedly declining, the survival of the species in Angola may not yet be threatened.

Conservation Measures Taken: Common in Kangandala National Park (Estes 1982), and also occurs in Kisama, Bikuar, Kameia and Mupa National Parks, and Luando, Mavinga, Luiana and Bufalo Reserves.

Roan (*Hippotragus equinus*)

Distribution & Population: Formerly widespread in the miombo woodland and northern coastal zones (Fig. 3), but this species has been eliminated from large areas of its former range. Numbers unknown, but certainly declining.

Status: Not regarded as threatened in 1975 (Bothma 1975), when it was well represented in several conservation areas. Since then it has suffered severely from poaching in areas such as Kisama, Kameia, Bikuar and Kangandala, and its survival must now be threatened.

Conservation Measures Taken: In the early 1970s it was among the most abundant large herbivores in Kisama National Park (population about 2000), Kangandala National Park (about 100), Bikuar National Park, Mavinga and Luiana Partial Reserves. Also present in Kameia and Mupa National Parks, and Luando and Bufalo Reserves.

Sable (*Hippotragus niger*)

Distribution & Population: The giant sable (*H. n. variani*), considered by many to be perhaps the finest of all the antelopes, occurs only in Angola, between the Cuanza and Luando Rivers and immediately north of the Luando. The common sable (*H. n. kirkii*) occurs marginally in the extreme southeast, and probably in the extreme east (Fig. 3). The total population of giant sable was estimated to be about 2–3000 in 1969–70, with the bulk of the population (1–3000) in the Luando Reserve, 100–150 in Kangandala National Park, and small numbers in the vicinity of these

conservation areas (Estes & Estes 1974). In 1982, observations in Kangandala and interviews with game guards suggested a total population of at least 100 giant sable in the national park, with at least several hundred still present in the Luando Reserve, and smaller numbers in the area between the national park and the reserve (Estes 1982). On a subsequent visit to Kangandala in October 1982, F. Horsten (in litt. 1983) failed to locate any sable during 3 days of intensive searching.

Status: Vulnerable. In 1982, it appeared that the giant sable had not been severely persecuted during the previous decade, despite the upheavals that have wracked Angola. Local hunters are apparently less likely to shoot sable than other game. This inhibition may result from the severe statutory penalty against hunting giant sable first enacted by the colonial administration. Apart from poaching and disturbance by military operations, the major long-term threat to the giant sable is the large human population within the Luando Reserve (17 200 in 1972 and now considerably larger) and Kangandala National Park (1–2000 and also increasing rapidly). The local Songo people are fishermen and shifting cultivators, not hunters. At present considerable tracts of good sable habitat remain both within and outside the national park and reserve. However, at the present rate of human increase, large-scale degradation of the sable's woodland habitat will commence within the next decade.

Conservation Measures Taken: The giant sable is confined to the Luando Reserve and Kangandala National Park and their immediate surrounds, and is specially protected in the Angolan hunting regulations. The common sable occurs in Mavinga and Luiana Partial Reserves.

Conservation Measures Proposed: Conservation of the giant sable assumes a high international priority in antelope conservation. The key to the giant sable's long-term survival is separation of the human and wildlife populations in the Luando-Kangandala area before most of the sable's habitat has been eliminated. Detailed recommendations have been made to secure the giant sable's future (Estes 1982).

Key elements of these recommendations include establishment of a Giant Sable National Park incorporating the existing Kangandala National Park, the greater part of the Luando Reserve, and the proposed national park extension between Kangandala and the reserve (Fig. 2), and exclusion of human settlement, cultivation, livestock and woodcutting from this park. Enough other land would have to remain available for human exploitation to satisfy the needs of the present population for cultivation, building materials and fuel. Benefits to the local people from the proposed Giant Sable National Park could arise from the utilisation of peripheral giant sable herds outside the park, e.g., through carefully managed trophy hunting by tourists, and establishment of a fenced giant sable breeding station to provide surplus animals for sale to North American and European zoos.

Gemsbok (*Oryx gazella gazella*)

Distribution & Population: Confined to semi-arid and arid savanna, grassland and desert of the southwest (Fig. 3), where it was formerly common. Numbers have probably declined over the last decade.

Status: Threatened by uncontrolled hunting.

Conservation Measures Taken: Formerly common in Iona National Park (population about 1500 in the early 1970s) and also occurs in Mocamedes Partial Reserve.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: Formerly widespread and locally abundant on floodplains, other extensive grasslands and open savanna woodland in southern Angola (Fig. 3). It has been eliminated from considerable parts of its range and its populations reduced by uncontrolled hunting and competition for food and water with domestic livestock.

Status: Probably not yet threatened.

Conservation Measures Taken: Formerly abundant in Bikuar and Kameia National Parks and Mavinga and Luiana Partial Reserves. Also occurs in Mupa National Park.

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Population: The red hartebeest is confined to a small area in southern Angola between the Cunene and Cubango Rivers (Fig. 3). Numbers unknown, but small.

Status: Never abundant in Angola, this species may have been reduced to the point of extinction.

Conservation Measures Taken: Recorded from Mupa National Park.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Population: Formerly occurred in northeastern Angola (Fig. 3), where its range and numbers have probably been reduced greatly by uncontrolled hunting.

Status: Classified as "threatened with extinction" in Angola in 1975 (Bothma 1975), and its status can hardly have improved in the intervening decade.

Conservation Measures Taken: Recorded from Kameia National Park.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Formerly occurred locally in suitable floodplain and open woodland habitat in eastern Angola (Fig. 3). Now eliminated from much of its range. Numbers unknown.

Status: Classed as rare in 1975 (Bothma 1975). Its survival in Angola is probably now threatened.

Conservation Measures Taken: Occurs in Kameia National Park, and Mavinga and Luiana Partial Reserves.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Occurs on the escarpment and rocky hillsides in the southwest (Fig. 3). Numbers unknown, but probably remains locally common within its restricted range.

Status: Not threatened.

Conservation Measures Taken: Occurs in Iona National Park and Mocamedes Partial Reserve.

Kirk's Dikdik (*Madoqua kirkii*)

Distribution & Population: Occurs in thickets and thorn scrub in the arid southwest (Fig. 3), extending into the coastal desert along thicket-lined watercourses (Smithers 1983). Numbers unknown, but locally common.

Status: Not threatened.

Conservation Measures Taken: Occurs in Bikuar, Iona and Mupa National Parks, and Mocamedes Partial Reserve.

Oribi (*Ourebia ourebi*)

Distribution & Population: Formerly widespread in central, southern and southeastern Angola (Fig. 3), and probably still occurs locally over a substantial part of its former range. Numbers unknown.

Status: Not threatened.

Conservation Measures Taken: Occurs in Bikuar, Kameia and Mupa National Parks, and Luando, Mavinga and Luiana Reserves.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Occurs widely in the southern mopane/*Baikiaea*/thorn scrub savanna and grassland, extending

northwards into the southern part of the miombo woodland zone (Fig. 3). Numbers unknown, but locally common.

Status: Not threatened.

Conservation Measures Taken: Occurs in Bikuar, Iona and Mupa National Parks, and Mocamedes, Mavinga and Luiana Reserves.

Impala (*Aepyceros melampus*)

Distribution & Population: The black-faced impala (*A. m. petersi*) is confined to the southwest, and the common impala (*A. m. melampus*) to the southeast (Fig. 3). Numbers unknown, but continued overhunting had reduced the population of the black-faced race, in particular, to low levels by the early 1970s.

Status: The impala's survival in Angola is undoubtedly threatened.

Conservation Measures Taken: The black-faced impala occurs in Bikuar, Iona and Mupa National Parks, and the common impala in Mavinga and Luiana Partial Reserves.

Springbok (*Antidorcas marsupialis*)

Distribution & Population: Occurs in the coastal desert and grassland of the southwest (Fig. 3), where it was formerly abundant. Numbers unknown, but probably still common locally.

Status: Not threatened.

Conservation Measures Taken: In the early 1970s, the springbok was abundant in Iona National Park (population about 2000), Chimalavera Regional Natural Park, and Mocamedes Partial Reserve. It still occurs in these three conservation areas, probably in reduced numbers.

References

Bothma, J. du P. 1975. Conservation status of the larger mammals of southern Africa. *Biological Conservation 7:* 87–95.

Dorst, J.; Dandelot, P. 1970. A field guide to the larger mammals of Africa. London, Collins.

Estes, R.D. 1982. The giant sable and wildlife conservation in Angola. Report to IUCN/SSC.

Estes, R.D.; Estes, R.K. 1974. The biology and conservation of the giant sable antelope, *Hippotragus niger variani* Thomas, 1916. *Proceedings of the Academy of Natural Sciences of Philadelphia 126:* 73–104.

Horsten, F. 1982. Os parques nacionais e as outras zonas de proteccao da naturcza de Angola. *Tecnicos e Agentes de Conservacao da Natureza* No. 2, 69 pp. Luanda, Direccao Nacional da Conservacao da Natureza, Ministerio da Agricultura.

Huntley, B.J. 1972. Preliminary guide to the national parks and reserves of Angola. Report to Direccao Provincial dos Servicos de Veterinaria, Luanda.

Huntley, B.J. 1976. Angola: a situation report. *African Wildlife 30*(1): 10–14.

Huntley, B.J. 1982. Visit to Angola: Dr. R.D. Estes. Commentary on reports submitted. Report to IUCN. CSIR, Pretoria.

Kingdon, J. 1982. East African mammals. An atlas of evolution in Africa. Vol. III, parts C & D (Bovids). London, Academic Press.

Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.

Note added in proof: Recent information obtained by B.J. Huntley (in litt. April 1988) indicates that protection of the giant sable is being maintained in Kangandala and the Luando Reserve, but that protection of Angola's other parks and reserves ranges from poor (e.g., Kisama) to non-existent (e.g., Bikuar, Iona and Luiana).

Chapter 4: Zambia

R.C.V. Jeffery, R.H.V. Bell and W.F.H. Ansell

Introduction

Zambia consists largely of a series of flat or gently undulating plateaux between 900 m and 1500 m in altitude, with degrading plateaux (basement geology) over most of the country and aggrading plateaux on Kalahari sands in the west. The plateaux are dissected in the east and south by the Luangwa and Zambezi Valleys, which comprise a southwestern extension of the Rift Valley system. These valleys are bordered by steep escarpments. Mean annual rainfall exceeds 1000 mm over most of the plateaux, but is less than 1000 mm in the Luangwa and Zambezi Valleys.

The dominant natural vegetation of the plateau regions is open, deciduous *Brachystegia/Julbernardia* ("miombo") woodland (Fig. 1), which includes extensive grassy dambos along drainage lines. Patches of moist evergreen forest occur in wet dambos and along major rivers within the woodland on the northern plateaux. In the northwest and west, there are also areas of dense, dry *Cryptosepalum* forest, and dry open grassland. Stunted *Brachystegia/Julbernardia* woodland savanna extends on to the Rift Valley escarpments. *Brachystegia* woodlands also cover extensive areas of the Rift Valley floors. Relatively small areas of montane grassland with patches of evergreen forest occur on the Nyika Plateau and adjacent mountains in the northeast (Fig. 1). Open woodland dominated by mopane (*Colophospermum mopane*) is characteristic of the major valleys, and also occurs on parts of the southern plateau. Several major swamps and floodplains occur in depressions on the plateaux, e.g., the vast floodplains and smaller area of permanent swamps bordering Lake Bangweulu, the Kafue Flats on the floodplain of the Kafue River, and the Lukanga and Mweru Wantipa wetlands. Liuwa Plain in western Zambia is often considered to be a wetland (e.g., Clarke 1975), but in fact is a well drained area of short grassland on Kalahari sand.

The Luangwa and Zambezi Valleys and extensive areas of the plateau woodlands are infested with tsetse fly and thinly inhabited by humans, although agricultural settlement is expanding into the more fertile floodplains and dambos. Some antelopes and other large wildlife species still occur widely, but many are becoming increasingly confined to conservation areas where they are afforded some protection. National parks (including several former game reserves gazetted as national parks in the early 1970s) cover 8% of the country. Game management areas and forest reserves cover an additional 21%. This excellent system of conservation areas was formerly among the best administered and managed in Africa. Over the last decade, the economic situation in Zambia (decline in purchasing power) and rise in the value of wildlife trophies (ivory and rhino horn) has provided a powerful incentive to illegal wildlife utilisation. This has been allowed to proceed largely unchecked, because of regional insecurity and reduction of law enforcement capability caused by economic constraints, resulting in a massive increase in wildlife poaching.

Despite these adverse factors, Zambia maintains a strong commitment to wildlife conservation at the highest levels of Government. This is exemplified by the National Conservation Strategy published in February 1986. The National Conservation Strategy emphasizes agricultural development (with reduced reliance on copper) and environmental conservation. It recognises

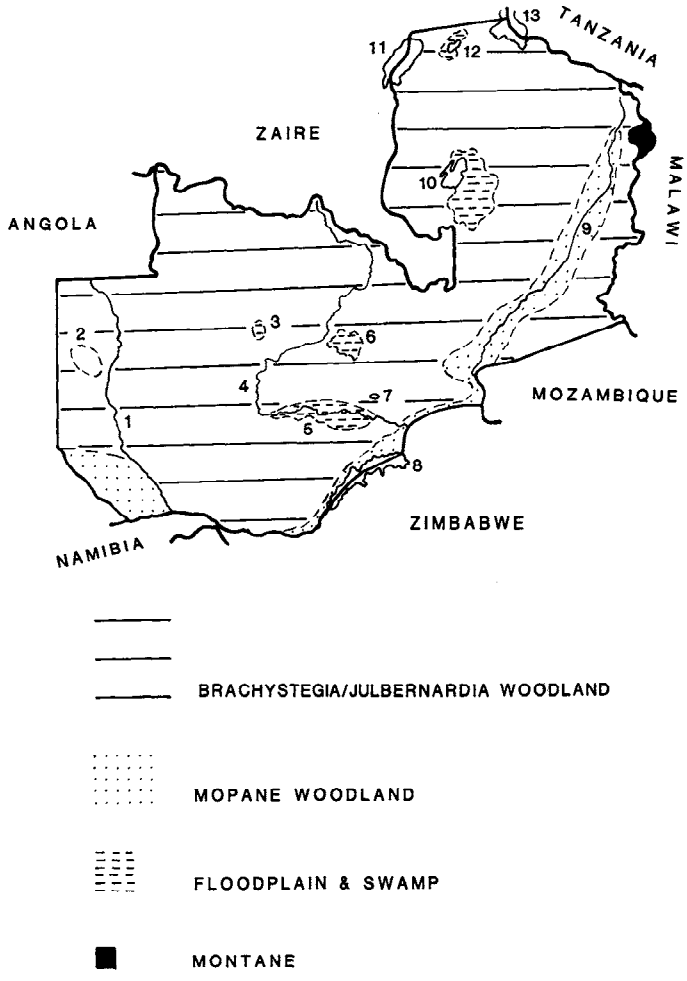

Fig. 1. Approximate natural vegetation zones of Zambia (simplified). 1: Zambezi River. 2: Liuwa Plain. 3: Busanga Plain. 4: Kafue River. 5: Kafue Flats. 6: Lukanga Swamp. 7: Lusaka. 8: Lake Kariba. 9: Luangwa River. 10: Lake Bangweulu. 11: Lake Mweru. 12: Lake Mweru Wantipa. 13: Lake Tanganyika.

the ecological and economic values of wildlife, e.g., for tourism and protein production, such as harvesting floodplain antelopes in the Bangweulu Basin and Kafue Flats. The national parks play a major role in Zambia's developing tourist industry, which generated 58 million Kwacha in 1983, a 5-fold increase since 1979 (Bwanga 1984).

Current Status of Antelopes

Antelope species characteristic of *Brachystegia/Julbernardia* woodland, such as sable, roan, Lichtenstein's hartebeest, southern reedbuck, eland and grey duiker, formerly occurred throughout most or all of the plateau regions of Zambia. Other widespread species such as waterbuck, greater kudu and impala were most abundant in the Luangwa and Zambezi Valleys, where the arid/eutrophic savannas support a greater biomass of large herbivores than the moist/dystrophic savannas of the plateaux (Bell 1981, 1982, 1986a, b). Yellow-backed and blue duikers occurred widely in suitable forest and thicket habitat, with lechwe, tsessebe and puku locally abundant on floodplains and/or riverine grasslands, and large numbers of sitatunga in the swamps.

This overall situation still applies, at least in the national parks, although the numbers of most species are declining and their ranges contracting outside conservation areas. While the current situation is generally satisfactory (Table 1), the status of many species is dependent on effective protection within the national parks. Half of Zambia's 22 antelope species, viz., eland, lechwe, puku, reedbuck, roan, sable, wildebeest, hartebeest, tsessebe, oribi and impala, are now vulnerable or rare *outside* the national parks. A 12th species, Natal red duiker, occurs in only one national park and has not been recorded elsewhere in Zambia.

Table 1
Current Status of Antelopes in Zambia

Species	Status*	Species	Status
Bushbuck	S	Southern Reedbuck	S
Sitatunga	S	Roan	S
Common Eland	S	Sable	S
Greater Kudu	S	Blue Wildebeest	S
Blue Duiker	S	Lichtenstein's	
Natal Red Duiker	R	Hartebeest	S
Yellow-backed Duiker	S	Tsessebe	V
Grey Duiker	S	Klipspringer	S
Waterbuck	S	Oribi	S
Lechwe	S	Steenbok	S
Puku	S	Sharpe's Grysbok	S
		Impala	S

* R = rare; V = vulnerable; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

Conservation Measures Taken

The national parks system (Fig. 2) was set up to include as many mammal species and habitat types as possible, and as a consequence it includes representative examples of almost all of the country's major antelope habitats.

Kafue is one of the largest national parks in Africa and was the first to be gazetted in Zambia, in 1951. It consists mainly of plateau *Brachystegia/Julbernardia* woodlands, but also includes patches of *Baikiaea* forest, extensive areas of floodplain grassland on the Busanga Plain (about 250 sq km within the national park) on the northern boundary, and along perennial rivers, and areas of mopane woodland in the south. Some riverine grassland in the south of this national park was drowned by the Itezhi-Tezhi dam, but the man-made lake is developing its own shoreline vegetation and wildlife habitat.

Grimwood et al. (1958) noted that Kafue National Park was the major Zambian stronghold of *Brachystegia* woodland antelopes such as sable, roan and Lichtenstein's hartebeest, and this applies even more today. With locally high densities of other species such as wildebeest, waterbuck, puku and lechwe on the riverine and floodplain grasslands, Kafue National Park supports 20 antelope species, a greater number than any other national park in Africa.

Substantial areas of *Brachystegia/Julbernardia* woodland are also included in most of the other plateau national parks, e.g., Mweru Wantipa, Nsumbu, Lusenga Plain, Kasanka, Lavushi Manda, Lukusuzi, West Lunga and Lower Zambezi (which is mainly escarpment and plateau). This varies from tall, dense woodland on steeply rolling terrain with deeply sunk, marshy dambos which support good numbers of puku and sitatunga, e.g., Kasanka, to stunted woodland on flat and escarpment terrain, with incised river channels and fewer dambos, e.g., Lavushi Manda, which supports very low wildlife densities and is mainly of scenic value. Blue Lagoon and Lochinvar National Parks protect parts of the Kafue Flats. Some of the other plateau national parks contain extensive areas of swamps (Mweru Wantipa and to a lesser extent Kasanka and West Lunga), lakeshore (Nsumbu), floodplain and/or dry, open grassland (Lusenga Plain, West Lunga, Liuwa Plain, and Sioma Ngwezi). Wildebeest and tsessebe are

the dominant antelopes on the short grassland of Liuwa Plain National Park. Isangano National Park includes *Brachystegia* and *Erythrophleum/Pterocarpus* woodland and open grassland on the border of the Lake Bangweulu floodplain. Nyika National Park contains montane grassland and patches of evergreen forest. West Lunga National Park protects a substantial example of the *Cryptosepalum* forest characteristic of the northwest. Sioma Ngwezi National Park in the southwest comprises a mosaic of woodland savanna (including mopane) and open plains.

North and South Luangwa National Parks have been game reserves since the late 1930s and were raised to national park status in the early 1970s. They include substantial areas of mopane savanna, *Kigelia/Combretum* and *Combretum/Terminalia* woodlands, thicket, riparian forest and grassland on the western side of the Luangwa River, with extensive *Brachystegia/Julbernardia* woodlands away from the river and towards the foot of the Muchinga Escarpment. Considerable lengths of the western boundaries of both the Luangwa National Parks extend to the top of the escarpment. South Luangwa National Park includes areas on the eastern side of the river in its Nsefu and southern sectors. Luambe National Park also protects an area of riverine habitat on the east bank of the river, between the North and South Luangwa National Parks. Mopane savanna and other riverine valley habitats are included in Lower Zambezi and Mosi-Oa-Tunya National Parks. The latter is primarily aimed at protecting the area around Victoria Falls and contains little wildlife, apart from small numbers of antelopes and other species introduced into a fenced game park.

Despite serious problems arising from the effects of increased poaching, agricultural encroachment, illegal grazing by domestic livestock, uncontrolled fires, and shortages of trained staff, equipment, and transport, the general integrity of the national parks has been maintained. Some, e.g., Kafue, North and South Luangwa, Luambe and Kasanka, continue to be sufficiently well staffed and managed to restrict poaching of antelopes to an acceptable level, although the populations of more commercially valuable wildlife species such as elephant (*Loxodonta africana*) and black rhinoceros (*Diceros bicornis*) have been severely reduced by poaching, e.g., in the Luangwa Valley (Leader Williams 1985). However, in other national parks such as Lower Zambezi (Chabwela 1985) protection has declined to the level where it is now poor or non-existent. The same applies to the extensive game management areas, which are mainly located adjacent to national parks and could form effective buffer zones if they were protected and managed more rigorously.

Conservation Measures Proposed

The National Conservation Strategy recognises that ecologically sound development based on the conservation of soil, water and other natural resources is the key to Zambia's economic recovery. Realisation of the potential of the country's rich wildlife resources to play a significant role in Zambia's future economic growth will depend on revitalisation of the protection and management of the conservation areas to their former high standards. In a developing country such as Zambia, this will require considerable international assistance for the development and implementation of effective management plans for national parks, game management areas, and forest reserves. Urgent requirements include increased numbers of trained staff and greater financial resources to manage the country's wildlife estate, e.g., for increased anti-poaching activities, and the development of rational solutions to conflicts of land use between wildlife conservation and the needs of surrounding human populations.

The long-term future of Zambia's antelopes and other wildlife will depend not only on improvement of the Department of National Parks and Wildlife Service and increased law enforcement, but equally on more sympathetic public attitudes to wildlife (Bwanga 1984). The education programme organised by the Wildlife Conservation Society of Zambia is performing a vital role in increasing public awareness of the values of wildlife. By 1985 there were >1100 Chongololo Clubs (junior students) and >150 Conservation Clubs (senior students) operating in the country's schools.

Fig. 2. National parks of Zambia. 1: Kafue (22 400 sq km). 2: Liuwa Plain (3660 sq km). 3: West Lunga (1684 sq km). 4: Sioma Ngwezi (5276 sq km). 5: Mosi-Oa-Tunya (66 sq km). 6: Blue Lagoon (450 sq km). 7: Lochinvar (410 sq km). 8: Lower Zambezi (4140 sq km). 9: Mweru Wantipa (3134 sq km). 10: Nsumbu (2020 sq km). 11: Lusenga Plain (880 sq km). 12: Isangano (840 sq km). 13: Nyika (80 sq km). 14: Kasanka (390 sq km). 15: Lavushi Manda (1500 sq km). 16: North Luangwa (4636 sq km). 17: South Luangwa (9050 sq km). 18: Luambe (254 sq km). 19: Lukusuzi (2720 sq km).

Major current developments in wildlife conservation in Zambia include a WWF/IUCN-sponsored project on the conservation and utilisation of the natural resources of the Bangweulu wetlands, and the Luangwa Integrated Resource Development Project in the South Luangwa National Park and adjacent Lupande Game Management Area. The Luangwa project aims to increase the productivity and revenue-earning potential of the natural resources in the project area, and to redistribute the benefits to the people of the area. This is expected to provide incentives towards sustainable use of natural resources and towards discouraging illegal offtake of wildlife (Bell & Lungu 1986).

Species Accounts

Knowledge of the habitat, diet and reproduction of antelopes in Zambia has been summarised by Ansell (1960, 1978). This account concentrates on distribution, population and conservation status.

Information on antelope populations within national parks dates largely from the 1960s and 1970s, when a considerable amount of research was conducted in Zambia's conservation areas. In many cases these estimates are probably broadly representative of the current situation. Most estimates are only rough approximations of actual populations, with large sampling errors and in many cases serious bias, especially undercounting in aerial censuses of woodland habitats. Population estimates are based on the following sources unless stated otherwise—Luangwa Valley (20 000 sq km census area): Douglas-Hamilton et al. (1979); Kasanka and Lavushi Manda: Grimsdell & Bell (unpublished); Mweru Wantipa, Nsumbu and Lusenga Plain: Sinclair (unpublished); Ka-

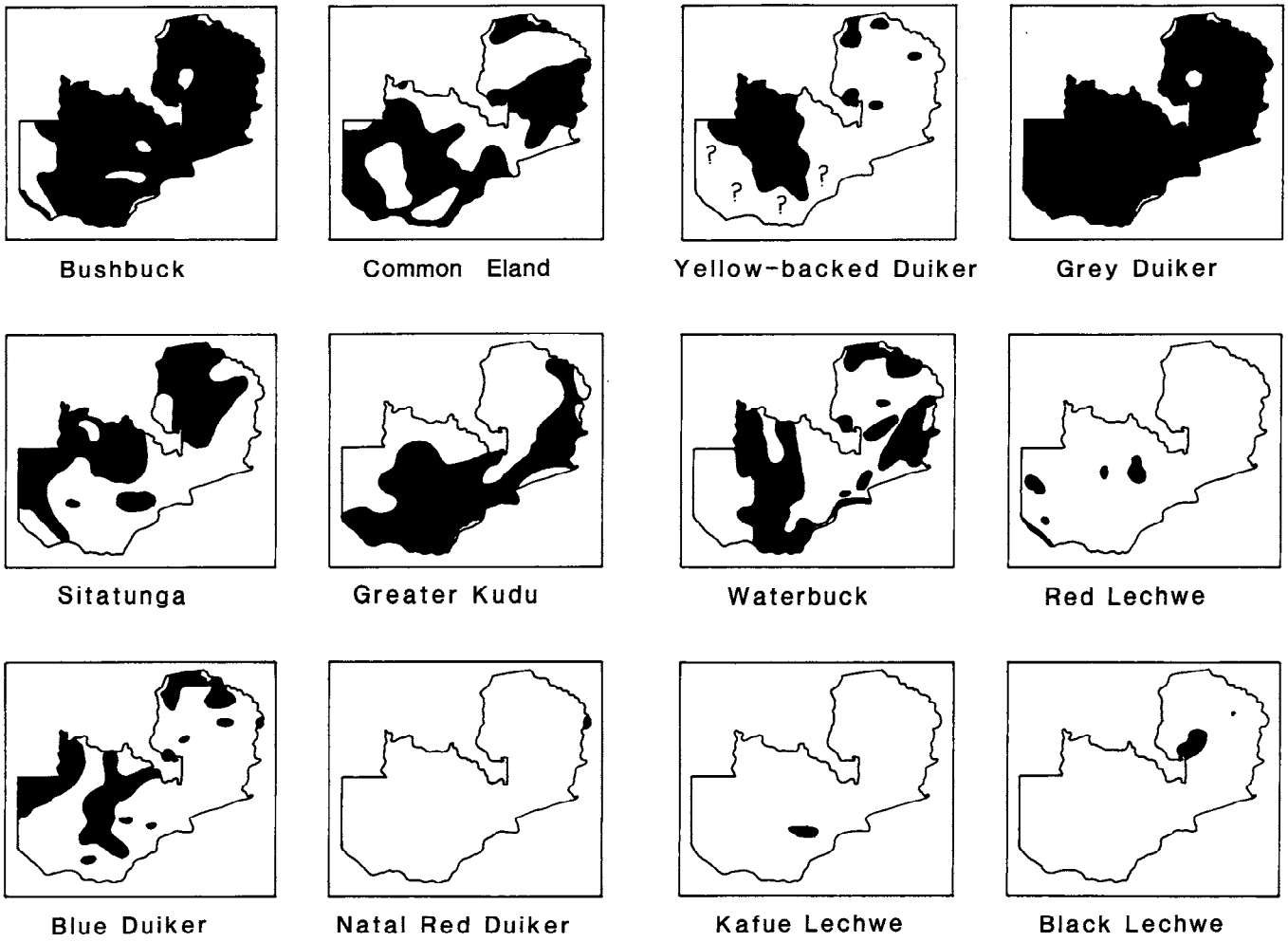

Fig. 3. Distribution of antelopes in Zambia (based on Ansell 1978). Shaded areas represent the approximate limits of the current distribution (not the area of continuous occurrence). See Ansell (1978) for detailed descriptions of each species' present and former distributions.

fue: Dowsett (1966), Ansell (1970), and comparison with population densities in *Brachystegia/Julbernardia* woodland in Kasungu National Park, Malawi (Bell 1981 and in the chapter on Malawi in this volume); Liuwa Plain and Sioma Ngwezi (populations/status): Benson (1969); Lochinvar: Rees (1978a); Blue Lagoon: Sayer & van Lavieren (1972); Bangweulu Basin: Grimsdell & Bell (1975).

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Formerly occurred throughout in suitable forest and bush habitat, except for parts of the western plateau. Still occupies almost all of its former range (Fig. 3). Numbers unknown, but locally common.

Status: Not threatened.

Conservation Measures Taken: Occurs in all of the national parks except Liuwa Plain, Sioma Ngwezi and Lochinvar. Common in the riverine areas of Kafue National Park and the Luangwa Valley, and in other areas such as Mweru Wantipa and Nsumbu National Parks. Rare in Lavushi Manda National Park.

Sitatunga (*Tragelaphus spekii*)

Distribution & Population: Occurs widely in swamps and marshy dambos on the plateaux (Fig. 3). Total numbers unknown, but it is one of the most numerous large antelopes in Zambia, reaching densities of 10–15 per sq km in suitable habitat, e.g., the Bangweulu marshes, where its population is probably at least 10–20 000 (Grimsdell & Bell 1975; Manning 1976).

Status: Not threatened. The sitatunga's secretive habits enable it to survive in large numbers close to human settlement, as long as sufficient areas of its swamp habitat remain intact. It is often thought to be rare because it is difficult to see on the ground, but its characteristic networks of tracks through tall swamp vegetation are easily seen from the air. These reveal its widespread presence, often in highly unlikely locations. In Bangweulu, for example, it was very common in marshy dambos where they pass through the middle of large villages (R.H.V. Bell, personal observations).

In the long term its survival in some wetlands could be threatened by developments which destroy its habitat, e.g., swamp drainage for agriculture, or flooding by hydroelectric schemes. The construction of hydroelectric dams on the Kafue River, for example, may have eliminated much of the sitatunga's habitat on the Kafue Flats.

Conservation Measures Taken: Common in Kasanka and Mweru Wantipa National Parks. Also occurs in West Lunga, Nsumbu, and Lavushi Manda (rare) National Parks, and in the Busanga swamps on the northern boundary of Kafue National Park, where it is locally common.

Eland (*Tragelaphus oryx*)

Distribution & Population: Formerly occurred throughout in moderate to low numbers, but now eliminated from many areas (Fig. 3). Total numbers unknown, but not large. Its major strongholds are the Luangwa Valley (population about 2000) and Kafue National Park (population >1000).

Status: Not threatened, as long as the larger national parks are maintained. Populations are small and declining outside the national parks.

Conservation Measures Taken: Occurs naturally in all of the

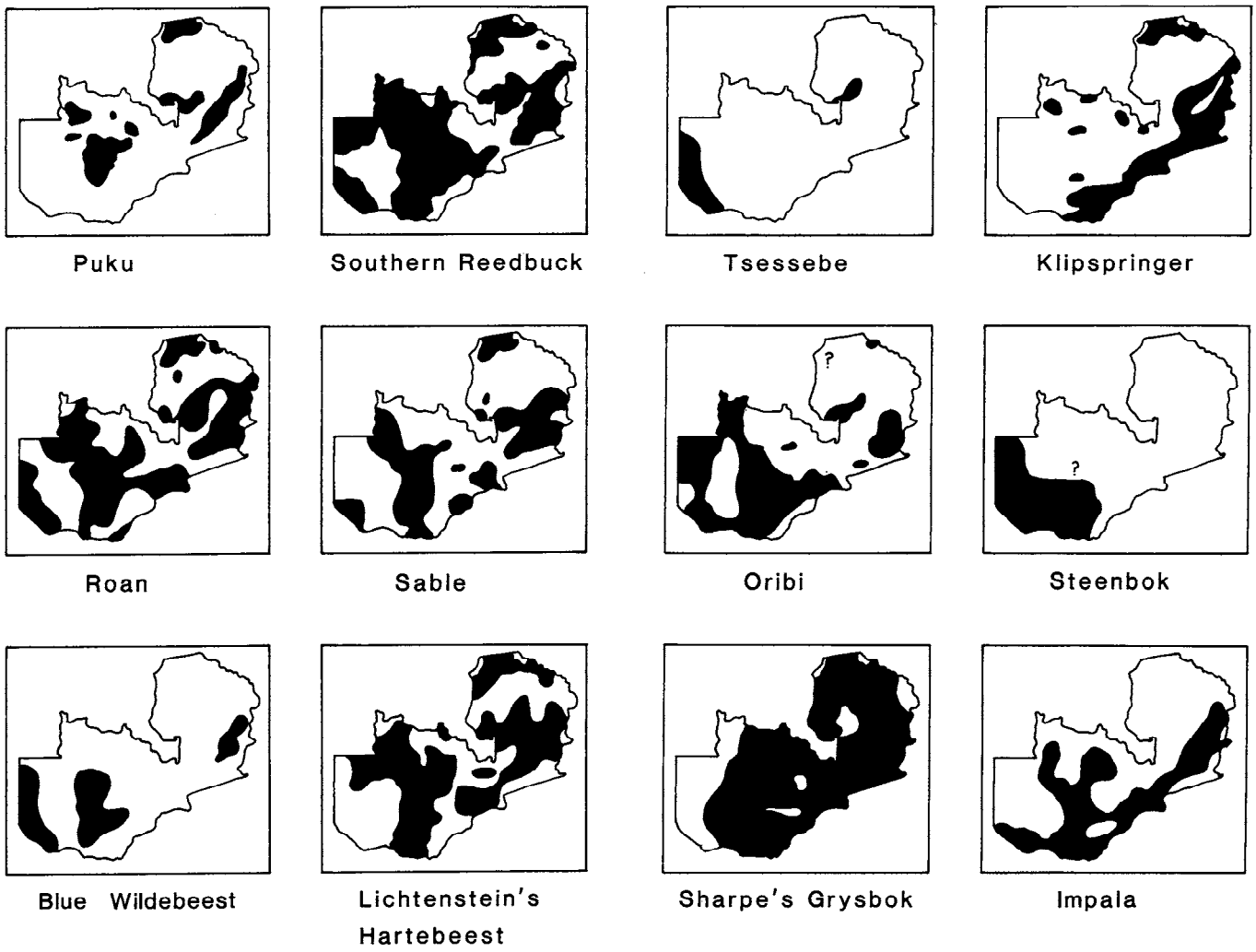

Fig. 3. Distribution of antelopes in Zambia—continued.

national parks except Blue Lagoon (where a small number was reintroduced in the early 1970s), Lochinvar, and Mosi-Oa-Tunya, but at low population densities (<0.2 per sq km). Large protected populations (>1000) are consequently confined to the largest conservation areas, such as Kafue and the Luangwa National Parks. Eland occur in populations of several hundred in some national parks, e.g., Mweru Wantipa and Nsumbu, but in very small populations (<100) in others, e.g., Kasanka, Lavushi Manda and Lusenga Plain. The vulnerability of small populations is highlighted by the species' disappearance from Lochinvar National Park. A population of about 140 eland was present when Lochinvar received national park status in 1972 (Rees 1978a), but disappeared in the early 1980s, because of either poaching or emigration (Sheppe 1985). Eland herds seem to require a large home range. The smaller parks may not be able to provide this if the surrounding areas are no longer available because of development or other human activity.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Probably still occupies much of its range in the Rift Valley and escarpment regions and on the drier parts of the plateaux; absent from the wetter moist/dystrophic savannas of the northern plateaux (Fig. 3). Numbers unknown, but locally common.

Status: Not threatened. Well represented in the national parks system. Outside conservation areas, its secretiveness and preference for cover enable it to withstand hunting pressure and survive near settlements better than most other large antelopes. It performs best on secondary vegetation associated with settlement.

Conservation Measures Taken: Common in Luambe National Park and the riverine areas of North and South Luangwa National Parks. Occurs at low to moderate densities in Kafue National Park. Also present in Sioma Ngwezi, Blue Lagoon, Lochinvar (small numbers), Lower Zambezi, and Lukusuzi National Parks.

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Occurs locally in suitable forest and thicket habitat, mainly in the higher rainfall areas (northwestern and northeastern plateaux), including montane forest in the northeast (Fig. 3). Numbers unknown, but not uncommon locally.

Status: Not threatened.

Conservation Measures Taken: Occurs in several national parks. Especially common in the *Cryptosepalum* forests of West Lunga National Park (Grimwood et al. 1958), and well represented in Nsumbu National Park and the northern part of Kafue National Park. Also recorded from Mweru Wantipa and Nyika National Parks.

Natal Red Duiker (*Cephalophus natalensis*)

Distribution & Population: In Zambia, known only from Nyika National Park (Fig. 3), where it is not uncommon in patches of montane forest (Dowsett 1979).

Status: Rare. The population of this species cannot be large within its very restricted Zambian range, but it is secure as long as its habitat is protected effectively.

Conservation Measures Taken: Nyika National Park's effective size as a conservation area is increased by the contiguous and much larger national park on the Malawi side of the Nyika

Plateau, at least for species which occupy the extensive montane grasslands or, as with the red duiker, may cross these grasslands to move between forest patches.

Yellow-backed Duiker (*Cephalophus silvicultor*)

Distribution & Population: Widespread in forests and thickets within the northerly, higher rainfall areas of the plateaux, especially in the northwest (Fig. 3). It is not uncommon in some localities. Its range probably extends further south than so far confirmed (Fig. 3; see Ansell 1978).

Status: Not threatened.

Conservation Measures Taken: A significant population occurs in the northern sector of Kafue National Park. Also well established in West Lunga National Park, and has been recorded from Mweru Wantipa, Nsumbu and Kasanka National Parks (Grimwood et al. 1958).

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Formerly throughout, and probably occupies almost all of its former range (Fig. 3). Numbers unknown, but locally common on the plateaux.

Status: Not threatened. Persists even in cultivated areas and suburbia, where sufficient cover remains to provide shelter.

Conservation Measures Taken: Occurs in all of the national parks, with the possible exceptions of Lochinvar and Luambe. Common in the woodlands of many of the plateau national parks, e.g., Kafue (population at least several thousand), Kasanka, Lavushi Manda, Lusenga Plain, Mweru Wantipa and Nsumbu, and in the montane grasslands of Nyika National Park (Dowsett 1979). Rare in riverine valley habitats, e.g., in the North and South Luangwa National Parks it is largely confined to *Brachystegia/Julbernardia* woodlands at the western edge of the valley.

Waterbuck (*Kobus ellipsiprymnus*)

Distribution & Population: Formerly occurred over most of Zambia, with *K. e. ellipsiprymnus* in the Zambezi and Luangwa Valleys, the eastern and parts of the southern plateaux, and defassa waterbuck (*K. e. crawshayi*) on the remainder of the plateaux. Still occurs widely, especially in and near conservation areas (Fig. 3). The total population numbers in the tens of thousands, with the species' greatest strongholds in the riverine areas of the Luangwa Valley (population about 10 000) and Kafue National Park (population at least several thousand).

Status: Not threatened.

Conservation Measures Taken: Very common locally within Kafue, North and South Luangwa, and Luambe National Parks. Also well represented in Mweru Wantipa (population about 450), Nsumbu (population about 400) and Kasanka (population about 200) National Parks, and occurs in West Lunga, Lower Zambezi, Lavushi Manda (population about 50), Lukusuzi, Isangano and Lusenga Plain (few) National Parks.

Lechwe (*Kobus leche*)

Distribution & Population: Three subspecies of lechwe survive: the red lechwe (*K. l. leche*) of the Upper Zambezi and Kafue Rivers and scattered locations elsewhere in northern and western Zambia, extending (at least formerly) into neighbouring Zaire, Angola, Namibia (Caprivi Strip), and Botswana; the Kafue lechwe (*K. l. kafuensis*), which is endemic to Zambia and occurs in one large population on the Kafue Flats; and the black lechwe (*K. l. smithemani*) of the Bangweulu Basin and upper Chambeshi River. Within Zambia, the red lechwe is now reduced to scattered remnants, the Kafue lechwe still occupies a large part of its former range, and the black lechwe occurs mainly in the Bangweulu Basin with small numbers on the Bwela Flats on the upper Chambeshi (where it was reintroduced in 1975 following extermination in the 1960s) (Fig. 3). A fourth subspecies, *K. l. robertsi,* now believed to be extinct, used to occur in northwestern Zambia in the drainage of the Luongo and Luena Rivers and the Pambashye Swamps (Ansell 1978: p. 59 and map 136; Ansell & Banfield 1979).

The red lechwe survives on the Busanga floodplain, on the Lukanga River between its confluence with the Kafue River and the Lukanga Swamps (Hanks (1969) reported a population of 6–800 in this area), on the floodplain of the Mashi River on the Angolan border in the southwest, and in a few places on the floodplains of the Zambezi and its tributaries in the west. Effective protection within Kafue National Park allowed the Busanga population to increase from about 100 in 1950 to >1100 in 1971 (Grimsdell & Bell 1972) and subsequently to >2000 in the early 1970s (Clarke 1975) and an estimated 3400 in 1985 (Howard & Chabwela 1987).

The Kafue lechwe population was estimated to number 90–95 000 ± 10–20 000 in 1970–72, before the operation of the hydroelectric dams on the Kafue River at either end of the Kafue Flats (Bell et al. 1973). Following closure of the dams, the population declined to 81 000 ± 19 000 in 1975 (Osborne et al. 1975), and 41 000 ± 9–12 000 in 1981 and 1983 (Howard & Jeffery (1983). This decline may have been coincidental, rather than reflecting a causal relationship between the closure of the dams and lechwe numbers. The lechwe population may have reached an historical peak in the early 1970s, followed by a natural population crash which may have occurred regardless of the hydroelectric developments. An aerial census of the Kafue Flats in November 1987 produced a population estimate of 50 700 ± 17 500 lechwe, suggesting that the population had probably not declined since 1983 and may have increased in that time (Howard & Jeffery 1987).

The black lechwe population of the Bangweulu floodplains had declined to about 16–17 000 by the late 1960s, but subsequently increased to about 25 000 in 1973 (Grimsdell & Bell 1975) and 41 000 in 1983 (Howard et al. 1984). The population decline was apparently caused primarily by a rise in water levels which resulted from tectonic tilting of the Bangweulu Basin floor. This seems to have caused the carrying capacity to fall below the threshold at which the prevailing hunting offtake was sustainable, resulting in a population collapse unaccompanied by either symptoms of overstocking or an unequivocal increase in hunting offtake. The population's recovery since 1970 is probably due to reduced hunting pressure because of emigration of people from the area and hunting becoming less cost-effective.

Status: At present, the species as a whole is not threatened in Zambia, with a total population of at least 80–90 000 and the major populations either stable or increasing. However, uncontrolled poaching and natural or man-induced alterations to water levels are potential or actual long-term threats to all of the surviving populations.

Alteration of the natural flooding regime by the Kafue dams could severely reduce the carrying capacity of the Kafue Flats for lechwe (Rees 1978a, b), and may interfere seriously with the subspecies' social behaviour (Schuster 1980). The area of seasonally inundated floodplain has been reduced, with the eastern end of the Kafue Flats now permanently inundated and much of the remaining floodplain probably permanently dry (Sheppe 1985). Despite the decline of more than 50% in the Kafue lechwe population between 1972 and 1981, and its apparent stabilisation between 1981 and 1987, the long-term effects of the dams on lechwe numbers cannot yet be predicted (Howard & Jeffery 1983). It is essential that regular monitoring of lechwe populations is continued to assess trends and provide a quantitative basis for their management.

Conservation Measures Taken: Red lechwe occurs in the north of Kafue National Park (Busanga). The Mashi River floodplain

is mainly in Angola, just outside Sioma Ngwezi National Park, and red lechwe occur only marginally in this park. This subspecies may also occur marginally in Liuwa Plain National Park (Benson 1969), but this park lacks suitable habitat and no lechwe were seen in the park or on the adjacent Lubansenshi and Lungwevungu floodplains during a survey in 1972 (R.H.V. Bell, personal observations).

The distribution of Kafue lechwe on the Kafue Flats has changed little since the dams were closed (Howard & Jeffery 1982), despite the decline in numbers, with large concentrations occurring only within or near Blue Lagoon National Park on the north bank of the Kafue River and Lochinvar National Park on the south bank. At least 10–20 000 lechwe utilised each of these national parks for part or all of the year in 1981–83. Considerable population shifts can occur between the north and south banks (Howard & Jeffery 1983, 1987).

Most of the black lechwe's current range lies within game management areas; small numbers (about 150 in 1973; R.H.V. Bell, personal observation) occur in Isangano National Park on the edge of the Bangweulu floodplains.

Conservation Measures Proposed: The lechwe is the characteristic antelope of oligotrophic central African floodplains. Since the Kafue Flats and Bangweulu Basin contain two of the three remaining major lechwe populations (the third being in the Okavango Delta, Botswana), Zambia has a major international responsibility for the conservation of this species. In addition, lechwe has high potential for protein production from floodplains where conventional agriculture is severely restricted, as recognised in Zambia's National Conservation Strategy.

Conservation measures required to ensure the survival of each lechwe subspecies in Zambia include:

Red lechwe—maintenance of effective protection of the Busanga floodplain population within Kafue National Park.

Kafue lechwe—more effective law enforcement to control poaching; further research into the present trend of the lechwe population, the reasons for its decline since the early 1970s, and the carrying capacity of the modified floodplain for lechwe; and controlled development of the Kafue Flats to allow sustainable utilisation of the lechwe population to be developed and integrated with other forms of land use. The aim should be to provide the maximum long-term benefits to surrounding human communities.

Black lechwe—implementation of development strategies which successfully integrate the attainment of improved living standards for Bangweulu's human populations, including their needs for settlement, agriculture, fishing and hunting, with the conservation requirements of the area's internationally significant populations of floodplain (black lechwe, southern reedbuck, tsessebe, oribi) and swamp (sitatunga) antelopes.

Puku (*Kobus vardoni*)

Distribution & Population: Formerly occurred widely in suitable grassland habitat, such as narrow riverine strips and marshy dambos within woodland. Usually avoids the more extensive floodplains favoured by lechwe and is intermediate between lechwe and waterbuck in its dependence on the close proximity of water (de Vos & Dowsett 1966). Now eliminated from much of its former range outside conservation areas (Fig. 3). The largest population (about 9000) is in the riverine areas of the Luangwa Valley. The total population is probably in the low tens of thousands.

Status: Not threatened, as long as it continues to be well represented in the national parks.

Conservation Measures Taken: Although eliminated from one of its former strongholds in the south of Kafue National Park by the artificial lake created by the Itezhi-Tezhi dam, it was always more numerous on riverine strips and floodplains in the northern part of this park, where it is still abundant (population at least several thousand). Also well represented in North and South Luangwa, Luambe, West Lunga, Kasanka (population about 500), Mweru Wantipa (population >2000), and Nsumbu (population about 2000) National Parks. Present, at least formerly, in smaller numbers in Lavushi Manda and Lusenga Plain National Parks.

Conservation Measures Proposed: Reinforcement of anti-poaching measures in Zambia's national parks to maintain effective protection of wildlife is of international significance for the puku's long-term survival, since this species is now threatened to some degree in all of the other countries in which it occurs, viz., Angola, Zaire, Tanzania, Malawi and Botswana.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Formerly occurred very widely, except in the low-lying valley floors, but now eliminated from considerable areas outside national parks and game management areas (Fig. 3). Total population unknown, but locally common within some national parks and on the Bangweulu floodplain (population >5000).

Status: Not threatened.

Conservation Measures Taken: Occurs in all the national parks, with the possible exceptions of Mosi-Oa-Tunya, Luambe, and Lower Zambezi. The major protected population, numbering well into the thousands, is in Kafue National Park. Reedbuck is also common in Kasanka, Lavushi Manda, Mweru Wantipa, and Nsumbu National Parks. Uncommon or rare in the Luangwa Valley national parks, where it occurs only in scattered localities away from the river, Liuwa Plain, Blue Lagoon, Lochinvar (population about 30 in 1972), and Lusenga Plain National Parks.

Roan (*Hippotragus equinus*)

Distribution & Population: Formerly throughout. Remains widespread, but now eliminated from considerable parts of its range outside conservation areas (Fig. 3). Total population unknown, but scarce and not commonly seen in most of its Zambian range.

Status: Reasonably secure within the national parks, but declining elsewhere. Its long-term survival in Zambia will depend on the maintenance of effective protection in conservation areas.

Conservation Measures Taken: The largest surviving population of roan in Zambia is in Kafue National Park, where it is locally quite common and probably numbers in the low thousands. It is also well represented in Mweru Wantipa (population about 1800), Nsumbu (population about 600), and Kasanka (population about 200) National Parks. Occurs in small to moderate numbers in the other plateau national parks: Lusenga Plain (population about 50), Isangano, Lavushi Manda (population about 100), Lukusuzi, Nyika, West Lunga, Liuwa Plain, and Sioma Ngwezi. Also present in the woodland sector and floodplain edge of Blue Lagoon National Park (population about 200). Unlike sable, roan occur in the lower parts of the Luangwa and Zambezi Valleys as well as in the plateau woodlands. Roan are widespread in small numbers in North and South Luangwa and Luambe National Parks (total population in the Luangwa Valley about 300) and also occur in Lower Zambezi National Park.

Sable (*Hippotragus niger*)

Distribution & Population: Formerly throughout except for parts of the western plateau west of the Zambezi, but now reduced to scattered, isolated remnants outside conservation areas (Fig. 3). Total population unknown, but unlikely to exceed 10 000.

Status: Secure in the national parks.

Conservation Measures Taken: The major surviving population (several thousand) is in Kafue National Park, where sable is common and easily seen. Also occurs at relatively high population

densities (0.4–0.5 per sq km) in Kasanka (population about 200) and Mweru Wantipa (population about 1800) National Parks. Present in most of the other plateau national parks, viz., Nsumbu (population about 200), Lusenga Plain (rare), Lukusuzi, Lavushi Manda (population about 150), West Lunga, and Sioma Ngwezi. Occurs in very small numbers in North and South Luangwa National Parks, where it is restricted to the *Brachystegia* woodlands at the foot of the escarpment, and also present (rare) away from the valley floor in Lower Zambezi National Park.

Wildebeest (*Connochaetes taurinus*)

Distribution & Population: The nominate subspecies was formerly widespread on the plateaux west of the Kafue River, with Cookson's wildebeest (*C. t. cooksoni*) restricted to the Luangwa Valley and its surrounds. Now survives mainly in conservation areas (Fig. 3), where it is locally abundant. The total population numbers well into the tens of thousands.

Status: Not threatened, as long as adequate protection is maintained within the national parks.

Conservation Measures Taken: *C. t. taurinus* is well represented in Kafue National Park (population at least several thousand and possibly > 10 000), especially on the Busanga floodplain, and in Liuwa Plain National Park, where the population probably varies between 25 000 and 50 000 (Howard & Conant 1983). The nominate subspecies also occurs in Lochinvar (population about 1400 in 1972) and Sioma Ngwezi National Parks. Cookson's wildebeest is well represented in the valley floor areas of North Luangwa National Park, Luambe National Park, and the Nsefu sector of South Luangwa National Park. It also occurs as an occasional vagrant in the southeastern parts of Lukusuzi National Park (Ansell 1982a). The total population of Cookson's wildebeest in the conservation areas and adjacent parts of the Luangwa Valley is usually considered to be several thousand (e.g., 5–6000, P.S.M. Berry, personal communication). The aerial census by Douglas-Hamilton et al. (1979) gave an estimate of 11 100 ± 3490.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Population: Formerly throughout, except for the southwestern plateau and most of the floor of the Zambezi Valley. Now eliminated from some parts of its range outside conservation areas (Fig. 3), but remains the commonest large antelope of the Zambian plateau woodlands. Total population unknown, but numbers at least in the tens of thousands.

Status: Not threatened. Its long-term survival is dependent on effective protection within the national parks.

Conservation Measures Taken: Its major stronghold is in Kafue National Park, where it is widespread and common (population probably > 10 000). Occurs at varying densities in most of the other plateau national parks: Mweru Wantipa (population about 900), Nsumbu (population about 1000), Lusenga Plain (population about 50), Isangano, Kasanka (population about 200), Lavushi Manda (population about 100), Lukusuzi (common (Wilson 1966); population probably > 1000), and West Lunga. In the Luangwa Valley (total population about 1100) it occurs mainly in the *Brachystegia* woodlands but occasionally enters the riverine areas of North and South Luangwa National Parks.

Conservation Measures Proposed: Lichtenstein's hartebeest is highly characteristic of *Brachystegia/Julbernardia* woodland. Its survival is now threatened in Angola, Zaire and Mozambique, and it occurs in relatively small, isolated populations in Malawi, Zimbabwe and South Africa (reintroduced). It remains widespread and abundant only in the conservation areas of southern Tanzania and Zambia. The implementation and maintenance of effective management of Zambian national parks with substantial populations is therefore of major international importance for the conservation of this species.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Restricted to open plains and woodland edges west of the Zambezi, the southeastern Bangweulu floodplain, and (formerly) the floodplains of the upper Chambeshi and Isoka Kalungu Rivers in the northeast; still occupies much of its range (Fig. 3). The total population is probably no more than a few thousand, with about 2000 in Bangweulu. Benson (1969) estimated a population of at least 1300 on the Liuwa Plain.

Status: Vulnerable, in view of its restricted distribution, small population, and the low level of protection in the conservation areas in which it occurs.

Conservation Measures Taken: Locally common, at least formerly, in Liuwa Plain and Sioma Ngwezi National Parks. The Bangweulu population occurs largely within game management areas.

Conservation Measures Proposed: The species' prospects for long-term survival in Zambia would be enhanced by more effective protection and management of the Liuwa Plain and Sioma Ngwezi National Parks, as well as the integration of wildlife conservation/utilisation programmes with the development needs of local people in the Bangweulu floodplains.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Widespread where there is suitable habitat of rocky hills and outcrops (Fig. 3). Numbers unknown, but locally common in the more extensive areas of hilly country, e.g., the valley escarpments.

Status: Not threatened.

Conservation Measures Taken: Occurs in most national parks with suitable habitat, e.g., North and South Luangwa (plentiful on the Muchinga Escarpment), Lower Zambezi, Nsumbu, Kasanka, Lavushi Manda, Lukusuzi, Nyika, and West Lunga. Unaccountably very rare and seldom recorded in Kafue National Park, despite plenty of apparently suitable habitat. Formerly known from one locality (Kainda Baila Hills) in southern Kafue, but disappeared before the national park was gazetted (Ansell 1970). Recorded in 1979–80 from a rocky ridge near Itezhi-Tezhi Lake within southern Kafue National Park (Ansell 1982b).

Oribi (*Ourebia ourebi*)

Distribution & Population: Formerly widespread on open plains and dambos on the western plateaux; confined to the Bangweulu floodplains and a few other scattered localities in the eastern half of the country. Now greatly reduced or eliminated from much of its range outside conservation areas (Fig. 3). Total numbers unknown, but probably in the low tens of thousands. The major surviving populations are in Kafue National Park (at least several thousand) and Bangweulu (> 5000).

Status: Not threatened, as long as it receives effective protection within national parks.

Conservation Measures Taken: Locally abundant in Kafue National Park. Also occurs in Liuwa Plain (population about 2000 in 1964), Sioma Ngwezi, West Lunga, Blue Lagoon (quite common), Lochinvar (population about 200 in 1972), Isangano, and Lavushi Manda National Parks. May also be present in small numbers in Lusenga Plain National Park (where it definitely occurred in the past, although scarce) and Lukusuzi National Park. It has been recorded in small numbers from a few scattered areas on the floor of the Luangwa Valley; localised and uncommon in South Luangwa National Park.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Confined to parts of the western and southwestern plateaux (Fig. 3). Numbers unknown, but for-

merly plentiful west of the Zambezi (Grimwood et al. 1958) and still common in some localities.

Status: Not threatened.

Conservation Measures Taken: Occurs in the southern part of Kafue National Park, where it is scarce, and in Liuwa Plain and Sioma Ngwezi National Parks.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Formerly widespread, except in the west, and probably still occupies much of its range (Fig. 3). Occurs in low to moderate numbers; not often observed because of its very secretive habits and preference for long grass or other cover.

Status: Not threatened.

Conservation Measures Taken: Occurs in Kafue (common; population probably at least several thousand), Blue Lagoon, Mosi-Oa-Tunya, Lower Zambezi, Kasanka, Lavushi Manda, North and South Luangwa (common), Luambe, Lukusuzi, Isangano, Lusenga Plain, Mweru Wantipa, and Nsumbu National Parks.

Impala (*Aepyceros melampus*)

Distribution & Population: Formerly occurred in the Luangwa and Zambezi Valleys and in scattered localities elsewhere, especially on the western and northwestern plateaux; now largely eliminated outside conservation areas (Fig. 3). The total population numbers well into the tens of thousands, with the greatest abundance in the riverine areas of the Luangwa Valley (population about 30 000).

Status: Not threatened as long as effective protection is maintained within the national parks.

Conservation Measures Taken: Abundant in North and South Luangwa and Luambe National Parks. Common in Kafue (population at least several thousand) and West Lunga National Parks. Not uncommon in Sioma Ngwezi and Lower Zambezi National Parks, and present in small numbers in Lochinvar National Park. Formerly occurred in Nsumbu, Mweru Wantipa and Lusenga Plain National Parks, but no longer survives in these northern parks.

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References

Ansell, W.F.H. 1960. Mammals of Northern Rhodesia. Lusaka, Government Printer.

Ansell, W.F.H. 1970. Letter to the editor. *Black Lechwe 8*(10): 28–29.

Ansell, W.F.H. 1978. The mammals of Zambia. Chilanga, National Parks & Wildlife Service.

Ansell, W.F.H. 1982a. Some mammal species absent from or marginal to Malawi. *Nyala 8*(1): 23–29.

Ansell, W.F.H. 1982b. "The mammals of Zambia" addenda and corrigenda, No. 1. *Black Lechwe NS 3:* 17–24.

Ansell, W.F.H.; Banfield, C.F. 1979. The subspecies of *Kobus leche* Gray, 1850 (Bovidae). *Saugetierkundliche Mitteilungen 40:* 168–176.

Bell, R.H.V. 1981. An outline of a management plan for Kasungu National Park, Malawi. *In* Jewell, P.W.; Holt, D.; Hart, D. (Editors). Problems of locally abundant wild animals, pp. 69–89. New York, Academic Press.

Bell, R.H.V. 1982. The effect of soil nutrients on community structure in African ecosystems. *In* Huntley, B.J.; Walker, B.N. (Editors). Ecology of tropical savannas, pp. 193–216. Berlin, Springer-Verlag.

Bell, R.H.V. 1986a. Soil-plant-herbivore interactions. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 107–130. Washington DC, US Peace Corps.

Bell, R.H.V. 1986b. Carrying capacity and off-take quotas. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 145–181. Washington DC, US Peace Corps.

Bell, R.H.V.; Lungu, F.B. 1986. The Luangwa Integrated Resource Development Project. Progress of phase I and proposals for phase II. Chipata, LIRDP.

Bell, R.H.V.; Grimsdell, J.J.R.; Van Lavieren, L.P.; Sayer, J.A. 1973. Census of the Kafue lechwe by aerial stratified sampling. *East African Wildlife Journal 11:* 55–74.

Benson, C.W. 1969. Large mammals of the Liuwa Plain and Sioma-Ngwezi Game Reserves, Barotse. *Puku 5:* 49–57.

Bwanga, D. 1984. Zambia's national parks and wildlife resources. *Black Lechwe NS 6:* 19–21.

Chabwela, H.N. 1985. Lower Zambezi: the future many times ignored. *Black Lechwe NS 7:* 19–23.

Clarke, J.E. 1975. Zambia's wetlands. *Black Lechwe 12*(1): 14–17.

De Vos, A.; Dowsett, R.J. 1966. Behaviour and population structure of three species of the genus *Kobus*. *Mammalia 30:* 30–55.

Douglas-Hamilton, I.; Hillman, A.K.K.; Holt, P.; Ansell, P. 1979. Luangwa Valley elephant, rhino and wildlife survey. Report to IUCN/WWF/NYZS, Nairobi.

Dowsett, R.J. 1966. Wet season game populations and biomass in the Ngoma area of the Kafue National Park. *Puku 4:* 135–145.

Dowsett, R.J. 1979. The discovery of the red forest duiker in Zambia. *Black Lechwe 13*(1): 10.

Grimsdell, J.J.R.; Bell, R.H.V. 1972. Population growth in red lechwe, *Kobus leche leche* Gray, in the Busanga Plain, Zambia. *East African Wildlife Journal 10:* 117–122.

Grimsdell, J.J.R.; Bell, R.H.V. 1975. Ecology of the black lechwe in the Bangweulu Basin of Zambia. Lusaka, National Council for Scientific Research.

Grimwood, I.R.; Benson, C.W.; Ansell, W.F.H. 1958. The present-day status of ungulates in Northern Rhodesia. *Mammalia 22:* 451–468.

Hanks, J. 1969. Recent lechwe counts in Zambia. *Puku 5:* 231–235.

Howard, G.W.; Chabwela, H. N. 1987. The red lechwe of Busanga Plain, Zambia—a conservation success. *Oryx 21:* 233–235.

Howard, G.W.; Conant, R.A. 1983. Nasal botflies of migrating wildebeest (*Connochaetes taurinus*) from western Zambia. *Journal of Natural History 17:* 619–626.

Howard, G.W.; Jeffery, R.C.V. 1982. Present distribution of lechwe on the Kafue Flats. *Black Lechwe NS 1:* 17–20.

Howard, G.W.; Jeffery, R.C.V. 1983. Kafue lechwe population status, 1981–1983. Report to National Parks & Wildlife Service, Chilanga.

Howard, G.W.; Jeffery, R.C.V. 1987. Kafue lechwe population census, November 1987. Report to National Parks and Wildlife Service and Zambia Wetlands Project.

Howard, G.W.; Jeffery, R.C.V.; Grimsdell, J.J.R. 1984. Census and population trends of black lechwe in Zambia. *African Journal of Ecology 22:* 175–179.

Leader Williams, N. 1985. Black rhino in South Luangwa National Park: their distribution and future protection. *Oryx 19:* 27–33.

Manning, I.P.A. 1976. Bangweulu: trails of the sitatunga. *Black Lechwe 12*(2): 14–19.

Osborne, T.; Howard, G.W.; Mpande, M. 1975. Annual Kafue Flats lechwe census, 4–9 November, 1975. Report to National Parks & Wildlife Service, Chilanga.

Rees, W.A. 1978a. Do the dams spell disaster for the Kafue lechwe? *Oryx 14:* 231–235.

Rees, W.A. 1978b. The ecology of the Kafue lechwe: as affected by the Kafue Gorge hydroelectric scheme. *Journal of Applied Ecology 15:* 205–217.

Sayer, J.A.; Van Lavieren, L.P. 1972. Notes on Blue Lagoon Ranch. Report to National Parks & Wildlife Service, Chilanga.

Schuster, R. 1980. Will the Kafue lechwe survive the Kafue dams? *Oryx 15:* 476–489.

Sheppe, W.A. 1985. Effects of human activities on Zambia's Kafue Flats ecosystems. *Environmental Conservation 12:* 49–57.

Wilson, V.J. 1966. Observations on Lichtenstein's hartebeest, *Alcelaphus lichtensteini*, over a three-year period, and their response to various tsetse control measures in eastern Zambia. *Arnoldia 2*(15): 1–14.

Chapter 5: Malawi

R.H.V. Bell

Introduction

Malawi is a small country lying along a southern branch of the Rift Valley system. It consists of high plateaux, mid-level plateaux and rift floor (much of which is occupied by Lake Malawi). These levels are separated by steep, broken escarpment complexes. The land area is 94 000 sq km, which with a human population of about 7 million, gives an overall density of 75 people per sq km, making Malawi the fifth most densely populated country in Africa. Pressures from expanding settlement have excluded most large mammals from cultivated lands, so that wildlife is now largely confined to national parks, game reserves and forest reserves.

Current Status of Antelopes

Although lying mainly within the *Brachystegia* woodland zone which covers a vast area of the low nutrient status soils on the central African plateau, Malawi contains a diversity of other types of vegetation, from montane forest and grassland in the north to dry open bush country and deciduous thickets in the Shire Valley in the south. This habitat diversity is reflected in the antelope fauna, which includes species characteristic of *Brachystegia* woodlands, such as sable, roan, Lichtenstein's hartebeest, and grey duiker, plus species typical of higher quality arid/eutrophic savannas on higher nutrient status soils, e.g., nyala, greater kudu, blue wildebeest (formerly) and impala.

Despite being a small, densely populated country, Malawi has lost only one species of antelope, the blue wildebeest, in the last 50–80 years, and the current status of the majority of the surviving 18 species is satisfactory (Table 1).

Conservation Measures Taken

Malawi's five national parks and four game reserves (Fig. 1) cover 11% of the land area of the country; they include representative examples of most of the country's major wildlife habitats (Clarke and Bell 1986). The Nyika National Park includes the open, rolling grasslands of the Nyika Plateau and patches of evergreen forest on the steep valleys and scarps below the eastern edge of the plateau. Kasungu National Park comprises mainly closed canopy *Brachystegia/Julbernardia* woodland on typical gently undulating plateau, with higher quality tall grass *Terminalia-Combretum* savanna in the valley areas. *Brachystegia* woodland on more hilly terrain is included in Majete Game Reserve and Nkhotakota Game Reserve, which lies on the broken escarpment complex immediately west of Lake Malawi. *Acacia* and mopane savannas on higher quality soils are represented in Liwonde and Lengwe National Parks and parts of Vwaza Marsh and Mwabvi Game Reserves. Lengwe, Mwabvi and Vwaza contain the country's only substantial examples of dry deciduous thickets. In addition to the national parks and game reserves, Malawi has numerous forest reserves covering 6% of the land area; these provide some protection to many of the remaining patches of montane or moist evergreen forests.

Most of Malawi's antelope species are now largely or entirely confined to conservation areas. The future of most species appears secure as long as these areas are maintained. Despite the problems arising from the dense human settlements which border many of Malawi's reserves (e.g., Bell 1981c; Bell and McShane-Caluzi 1986), the level of protection within the national parks, in particular, is reasonably effective compared to that in neighbouring countries and has been sufficient to allow most antelopes to maintain stable or increasing populations over the last 10–20 years. The level of protection within the game reserves and forest reserves is very severely constrained by lack of finance and is generally less satisfactory than that within the national parks.

Conservation Measures Proposed

Maintenance of the present satisfactory status of Malawi's antelope fauna will depend on the continuation of effective protection and management of its conservation areas. The standard of protection already achieved in Malawi's national parks gives them international importance and justifies international support to ensure their long-term protection.

There is a need for more funds to enable law enforcement to be improved, especially in the game reserves. The increasing difficulties which Malawi will encounter in maintaining its conservation areas were exemplified by the re-opening to settlement of 60% of the Mwabvi Game Reserve in 1982. Continued protection of its national parks and game reserves in the face of increasing pressures for more land for settlement will represent an outstanding achievement for a small country with a dense human population.

Species Accounts

The following accounts, which summarise the available information for each species, were completed in September 1985. Estimates of numbers are based on aerial and/or ground surveys and general observations. Many of these estimates are unreliable because of such factors as clumped distributions of antelopes, wooded habitats, and in some areas hilly terrain. Population estimates of Vwaza Marsh Game Reserve are from McShane (1985).

Nyala (*Tragelaphus angasii*)

Distribution & Population: Nyala formerly occurred throughout the thicket areas of the lower Shire Valley. Whether they extended to the upper Shire Valley is disputed; the author accepts, but Ansell (1981) rejects. At present, nyala are confined to three areas in the lower Shire Valley: Lengwe National Park, Mwabvi Game Reserve and Sucoma Game Ranch.

Numbers in Lengwe National Park in October 1982 were estimated at about 4300 in a high density population largely confined to the thicket margin area at the eastern tip of the park. The estimate was made by a modified capture-recapture technique using naturally marked animals visiting waterholes in the dry season (Bell 1981b; Bell & Dudley 1982). The nyala population has been increasing at an estimated 19% per year since the creation of the park and installation of artificial waterholes in 1967, from an estimated initial population of about 350. The dramatic increase has given rise to concern over the effect on the habitat and on other species, notably suni antelope and crested guinea fowl, and in 1981 a cull of 400 nyala was carried out. Culling was suspended following heavy rains in 1981–82, but resumed in 1983 (Mphande & Jamusana 1986) and 1984 with the removal of about 1000 each year. This has reduced the population to the desired level of about 2000.

Table 1
Current Status of Antelopes in Malawi

Species	Status*	Species	Status
Nyala	S	Roan	S
Common Eland	S	Sable	S
Bushbuck	S	Blue Wildebeest	Ex
Greater Kudu	S	Lichtenstein's Hartebeest	R
Blue Duiker	R		
Natal Red Duiker	R	Klipspringer	S
Grey Duiker	S	Oribi	R
Waterbuck	R	Sharpe's Grysbok	S
Puku	En	Suni	S
Southern Reedbuck	S	Impala	S

* Ex = extinct; En = endangered; R = rare; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

There are small populations in Mwabvi Game Reserve (probably <100, cf. Ridding 1975; Evans 1979) and Sucoma Game Ranch. About 50 nyala were translocated from Lengwe National Park to Sucoma in 1981. This population has increased to about 100.

Habitat, Food & Reproduction: The ecology of nyala is relatively well understood as a result of studies in South Africa, notably that of Anderson (1978). The Lengwe nyala are typical in preferring thicket margin habitat on very high quality soils. The majority of their diet is probably grass, but browse forms an important component in the dry season. Calving takes place throughout the year but with possible peaks in October and May (see also Anderson 1978).

Status: The status of the Lengwe population seems to be assured as long as the national park is maintained. In spite of a fairly heavy illegal offtake, the population continues to increase at about 19% p.a. The greatest threat now appears to be the risk of a population crash in the event of a dry rainfall cycle. In the very dry year of 1980 a minor die-off took place. For this reason, culling has been recommended to keep the population at a figure of about 2000 (Bell 1981a).

The future of the Mwabvi population is doubtful because of its low numbers and the re-opening to settlement of 60% of the game reserve in 1982.

Conservation Measures Taken: All the nyala in Malawi now occur within conservation areas, other than those in Sucoma Game Ranch and a small number which may occur in the re-opened part of Mwabvi Game Reserve.

Conservation Measures Proposed: Because of the doubtful future of the Mwabvi population and the need to cull the Lengwe population, a proposal has been put forward to introduce a new population to Liwonde National Park by translocation from Lengwe, to act as a second string in the event of threats to the Lengwe population. Liwonde probably contains suitable habitat, but the proposal has been opposed on the grounds that Liwonde is outside the former range of the species (cf. Ansell 1981). A policy decision from the Department of National Parks and Wildlife is awaited.

Additional Remarks: Following preliminary surveys carried out by Bell (1981a) in addition to the estimate of numbers mentioned earlier, a Research Unit has been established at Lengwe to investigate the ecology of nyala and their effect on habitats and other species.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Probably occurred throughout formerly. Now confined to Nyika National Park (population about

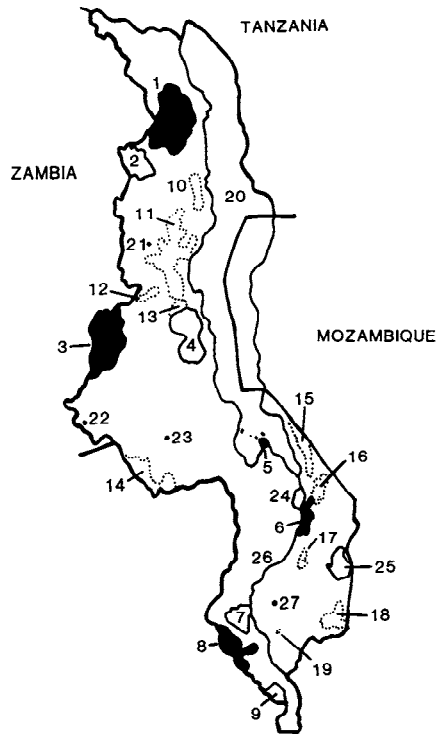

Fig. 1. Conservation areas of Malawi. 1: Nyika National Park (3134 sq km). 2: Vwaza Marsh Game Reserve (986 sq km). 3: Kasungu National Park (2316 sq km). 4: Nkhotakota Game Reserve (1802 sq km). 5: Lake Malawi National Park (94 sq km; includes several islands). 6: Liwonde National Park (548 sq km). 7: Majete Game Reserve (682 sq km). 8: Lengwe National Park (887 sq km). 9: Mwabvi Game Reserve (340 sq km). 10: North Viphya Forest Reserve & Army Range. 11: South Viphya Forest Reserve. 12: Chimaliro Forest Reserve. 13: Dwambezi Forest Reserve. 14: Dzalanyama Forest Reserve. 15: Namizimu Forest Reserve. 16: Mangochi Forest Reserve. 17: Zomba Forest Reserve. 18: Mulanje Mountain Forest Reserve. 19: Thyolo Mountain Forest Reserve. There are numerous other, mostly small forest reserves. Other localities: 20: Lake Malawi. 21: Mzimba. 22: Mchinji. 23: Lilongwe. 24: Lake Malombe. 25: Lake Chilwa. 26: Shire River. 27: Blantyre-Limbe.

1200 and increasing), Vwaza Marsh Game Reserve (about 75), Kasungu National Park (about 250), Nkhotakota Game Reserve (about 200), and Majete Game Reserve (occasional sightings); total population about 1750.

Habitat, Food & Reproduction: The populations of Vwaza, Kasungu and Nkhotakota are typical woodland populations, spending most of their time in *Brachystegia* woodland in herds of up to 50 or occasionally 100. In the case of the Vwaza and Kasungu populations, eland may make seasonal movements across the international boundary into Zambia. The Nyika population spends most of its time on the Nyika plateau grassland in large herds of up to 300. In the cold dry season (July–September) eland tend to move off the plateau into the wooded foothills. With the extension of the Nyika Park to include the wooded foothills in 1978, this seasonal movement is now protected and we expect that this will allow the population to continue to increase as it has been doing since the establishment of the original park in the 1950s. The diet of the eland is variable and subject to controversy. In Malawi it is probably primarily a grazer making extensive use of forbes and low browse, particularly in the dry season. No clearly defined reproductive peak has been noted.

Status: The Nyika population has been increasing at a rate averaging about 10% p.a. since the creation of the park in 1959. The status of the population is secure as long as this national park is maintained. The other populations seem to be more or less

stable although the estimates of numbers are not sufficiently precise to make positive statements.

Conservation Measures Taken: All the eland in Malawi are within conservation areas. They are occasionally killed by poachers, especially at Nyika, but are not generally a prime target.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Probably occurred throughout formerly, except for wetland areas. At present, occurs in all national parks and game reserves, many forest reserves and many open areas. The species is particularly common in more eutrophic areas such as the margins of the Nyika forests, the Vwaza pediments, the Kasungu valleys, Liwonde National Park in general and the thicket margin parts of Lengwe and Mwabvi. Bushbuck are present in low numbers in pure *Brachystegia* woodland. A recent ground strip census exercise resulted in an estimate of 1003 for the 104 sq km of "old" Lengwe (S.M. Munthali, unpublished).

Habitat, Food & Reproduction: No special information available.

Status: This species is common and widespread, and is probably increasing in the more recently gazetted protected areas such as Vwaza, Liwonde, Lake Malawi National Park and the Lengwe extensions. The only problems it may face are firstly local reduction, due to possible competition from nyala in Lengwe (where nyala have now been reduced to about 2000 by a culling programme) and Liwonde (should they be introduced) and secondly, possibly through their susceptibility to diseases such as rinderpest. Otherwise the species is secure.

Conservation Measures Taken: Well represented in conservation areas.

Additional Remarks: A study has been proposed to examine the relationship between bushbuck and nyala, and to a lesser extent, greater kudu. This study would be centered on Lengwe National Park, where all three species are common, but would refer also to Liwonde where bushbuck are extremely common, nyala currently absent, but to where they may be introduced. This study is currently in its early stages.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Probably occurred throughout formerly, except in montane and wetland areas. Currently present in generally low densities in most national parks, game reserves and forest reserves. The main populations (stable unless indicated otherwise) occur in Nyika National Park (present in wooded foothills of new extensions of the park; numbers unknown but probably increasing), Vwaza Marsh Game Reserve (probably at least 500 and numbers stable or increasing), Kasungu National Park (probably about 300), Nkhotakota Game Reserve (occasional sightings), Liwonde National Park (probably at least 750, may be increasing), Majete Game Reserve (about 1000), Lengwe National Park (at least 300; a recent ground strip census exercise (S.M. Munthali, unpublished) resulted in an estimate of 347 greater kudu), and Mwabvi Game Reserve (probably at least 300; likely to be decreasing as a result of re-opening to settlement of 60% of the reserve area).

Habitat, Food & Reproduction: Kudu occur in most of the wooded habitats in Malawi, but like impala perform poorly in low nutrient status habitats such as *Brachystegia* woodland, where they achieve low densities. As with impala, kudu achieve higher densities in mixed woodland including fine leaved species on higher quality soils, as in Vwaza, the valley sectors of Kasungu, Liwonde, Lengwe and Mwabvi. They also show a preference for secondarily immature woodland caused by elephant or cultivation. This is particularly obvious in Vwaza. The kudu is of course primarily a browser, but occasionally takes green grass leaf.

Status: The main populations of kudu in Malawi are probably stable or increasing, apart from that in Mwabvi Game Reserve which has probably been seriously affected by the re-opening in 1982 of 60% of the reserve.

Conservation Measures Taken: The majority of kudu in Malawi are contained in conservation areas. They are subject to occasional poaching but are not a prime target.

Natal Red Duiker (*Cephalophus natalensis*)

Distribution & Population: Probably occurred formerly in all areas of moist forest throughout the country. Now occurs in relatively small numbers in protected patches of montane or moist forest. F. Dowsett-Lemaire (personal communication) points out that the correct area identifications are as follows: Nyika National Park, Uzumara (North Viphya) Forest Reserve, Chimaliro Forest Reserve, North Viphya Army Range, South Viphya Forest Reserve (widespread), Nkhata Bay forests, Ntchisi Mountain Forest Reserve and Michese Forest Reserve. R.J. Dowsett (in litt. 19/8/85) states: "the sight records from Lengwe and Mwabvi are unacceptable, type specimen of *C. n. walkeri* turning out to be *Sylvicapra*. However, the type specimen of *C. n. bradshawi* is said to be correctly identified but the locus of Chiromo must be questioned. It probably also occurs in Mulanje Mountain Forest Reserve."

Habitat, Food & Reproduction: See Dowsett-Lemaire (1988).

Status: Apart from a small population in the forest patches of Nyika National Park, this species depends largely on the status of forest reserves containing moist forest patches. Some of these are relatively secure in terms of prevention of encroachment and illegal hunting, others much less so. In the relatively secure category is the South Viphya Forest Reserve, which probably contains much the largest population of red duiker in Malawi. However, in general, as emphasized by a review seminar on the status of conservation in the Afrotropical Realm (IUCN, July 1985), the importance of forest reserves to conservation is not widely appreciated in Africa and the relevant departments not usually aware of their responsibilities in this area.

It might be useful to bring certain key points to the attention of certain forest departments, and the forest duikers might fall into this category.

Conservation Measures Taken: Survives in areas where its forest habitat is protected.

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Formerly widespread in areas of forest and thicket, although its occurrence in areas of lowland dry thickets in the lower Shire Valley may be questioned. At present, occurs in relatively small numbers in protected patches of montane or moist forests. F. Dowsett-Lemaire (personal communication) points out that the correct area identifications are as follows: Misuku Hills Forest Reserve, Mafingu Hills Forest Reserve, Jembya proposed forest reserve, Nyika National Park, Uzumara Mountain Forest Reserve, South Viphya Forest Reserve, Nkhata Bay-Chinteche forests, Chimaliro Forest Reserve, North Viphya Army Range, Chongoni Forest Reserve, Chiradzulu Forest Reserve, Thyolo Mountain Forest Reserve, and Mulanje Mountain Forest Reserve. R.J. Dowsett (in litt. 19/8/85) notes that records from low altitude areas such as Lengwe National Park cannot be confirmed and are unacceptable.

Habitat, Food & Reproduction: See Dowsett-Lemaire (1988).

Status: Generally, as for *C. natalensis*. Emphasis must be placed on the importance of protection of forest reserves.

Conservation Measures Taken: Survives in areas where its forest habitat is protected.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Formerly throughout except for wetland areas and tall grass savanna of the lakeshore plain and

lower Shire Valley. This species remains common and widespread in all but densely populated areas. It occurs in all national parks, game reserves and many forest reserves, as well as widely in unprotected areas.

Habitat, Food & Reproduction: The grey duiker is common in a wide range of habitat types but appears to be particularly successful in *Brachystegia* woodland. Its populations appear to be less dense in arid-eutrophic areas, particularly in areas of tall grass *Combretum-Terminalia* savanna, as in the Kasungu valleys, mopane woodland in Vwaza and Liwonde, and *Acacia* savanna in Lengwe. It is very common at the margins of forest patches on the Nyika and Viphya plateaux and similar highland areas.

Status: This species is common in all conservation areas and in some open areas. Although it is subject to some licenced hunting in open areas and illegal hunting elsewhere, its status is secure in the foreseeable future.

Conservation Measures Taken: No specific measures have been taken beyond creation of protected areas in which it occurs.

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: Formerly, the waterbuck was probably widespread in riverine areas. At present, it occurs in four or five areas, viz., Vwaza Marsh Game Reserve (one female waterbuck sighted on the South Rukuru River in 1982; none present in 1985), Kasungu National Park (total population of 50–100 individuals (1982 estimate) located on the lower Lingadzi dambo where it forms the eastern boundary of the park; this population is very exposed to human disturbance and its status is doubtful; by 1985 numbers had declined to <50, perhaps as low as 20), Nkhotakota Game Reserve (commonly seen in riverine areas; population probably 100–200), Liwonde National Park (population probably about 500), and Majete Game Reserve (commonly seen on Shire River frontage; population possibly 100 animals). The total population is probably about 7–800.

Habitat, Food & Reproduction: The distribution of waterbuck in Malawi indicates clearly that this species is closely tied to areas of high nutrient status riverine grassland (whether or not under a woody canopy). This is particularly clear in Kasungu National Park where waterbuck only occur in one small area on the lower Lingadzi dambo where this dambo contains a pocket of fertile alluvium. Similarly, the relative abundance of waterbuck in Liwonde National Park is evidence of the same preference. One might, in fact, make the generalisation that the distribution of the *K. e. ellipsiprymnus* waterbuck is related to the relatively semi-arid eutrophic conditions in and to the east of the Rift Valley system, whereas the defassa waterbuck is related to the relatively moist oligotrophic conditions to the west of the rift system. The waterbuck is primarily a grazer, selecting leaves from the relatively high quality grasses of the high nutrient riverine areas in which it occurs. No records are available on breeding.

Status: The status of waterbuck in Liwonde National Park is secure as long as the park is maintained; in fact the population is probably still increasing, following the creation of the park in 1975. The populations in Nkhotakota Game Reserve and Majete Game Reserve are small but probably stable for the time being. The population in Kasungu National Park is very exposed and has suffered from the increase of settlement in the area; its status is doubtful. The population in Vwaza Marsh Game Reserve consists of at best a few individuals, probably as a result of dispersal from the Luangwa Valley, Zambia. We see no reason in principle why a viable population should not establish itself in this reserve.

Conservation Measures Taken: Apart from the animals that use the area just outside the boundary of Kasungu National Park, all waterbuck in Malawi are contained within conservation areas. The populations in most areas are subject to some level of poaching; proposals to improve the law enforcement capability are currently pending through lack of funds.

Conservation Measures Proposed: The priority requirement is the conservation of the population in Kasungu National Park. This is difficult because of the exposed location of the population on the boundary of the park in an area of intensive cultivation. Part of the exposed flank of the population has been protected by a buffer zone. It is hoped in the future to secure the area through construction of a tourist lodge in the area and by easing the pressure on the exposed bank of the Lingadzi dambo by construction of an electrified elephant barrier on its south bank. Funds are not currently available, however.

Puku (*Kobus vardoni*)

Distribution & Population: Probably fairly widespread formerly in the dambos of the plateau areas in Central and Northern regions (i.e., Lilongwe, Mchinji and Mzimba districts). Areas commonly reported to have held large concentrations of puku until the 1930s are the Bua and, particularly, the Rusa dambos in Mchinji and Kasungu districts. It also occurred on the Songwe River on the Tanzania border in the north (W.F.H. Ansell, in litt. 1/5/86). These populations are now extinct or very scarce.

Puku are now known to occur in very small numbers at only three locations in Malawi. These are Kasungu National Park, particularly at Lifupa dam (total population 20–25); Vwaza Marsh Game Reserve (3 seen in 1982; increased to about 18 in 1983–84; down to 12–15 in 1985); and Nyika National Park (2 seen in 1982; only 1 remaining in 1985).

All naturally occurring individuals seen in Malawi in the last 8 years have been adult females apart from an adult male found dead in Kasungu National Park in 1982 and a second adult male which appeared in the park in early 1984. None-the-less, the group of females at Lifupa dam had been slowly increasing from 0 in 1977 to 15 in 1982. Presumably the puku seen in Malawi are animals dispersing from elsewhere, either from the Rusa dambo in the case of Kasungu National Park, or from the Luangwa Valley in Zambia where they are very common. The fact that the great majority of dispersals is of adult females is of great interest, and may be due to the rigid territoriality or lek system thought to be adopted by the males of this species.

In October 1984 5 subadult males were translocated to Kasungu National Park from Zambia by the Department of National Parks and Wildlife (Bell & Nsamjana 1985). By December 1985, 8 calves had been recorded in the park, together with two leopard kills, one of an adult female and one of a translocated juvenile male, and the death of one female plus foetus due to parturition complications.

Habitat, Food & Reproduction: Puku are confined to high quality dambo or floodplain grassland. It is noticeable that the group of puku that has gradually accumulated at Lifupa dam is largely confined to a patch of improved pasture (improved with fertiliser and legumes) opposite the tourist lodge. Puku is primarily a grazer but may take small quantities of forbes in the dry season. The births in Kasungu National Park occurred in January, April, and between September and December.

Status: The status of puku in Malawi was dubious in the absence of males. The introduction of males by translocation and immigration should make it possible for small viable populations to build up in Kasungu National Park and Vwaza Marsh Game Reserve. The 2 puku resident at Chelinda on the Nyika National Park were in highly atypical habitat (montane grassland) where the species is not considered to have viable prospects.

Conservation Measures Taken: All puku known to occur in Malawi are within conservation areas. They do not seem to be vulnerable to poaching at present.

Conservation Measures Proposed: In the past the proposal has

been made to extend Kasungu National Park to include part of Rusa dambo with the intention of conserving an area of prime puku habitat. This proposal is now obsolete, due to the increase of settlement and estates in the intervening area. The future of puku in Malawi therefore depends on the establishment of viable populations in Kasungu National Park and Vwaza Marsh Game Reserve. It is proposed to translocate a few males from Kasungu to Vwaza Marsh once the Kasungu population is sufficiently well established.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Formerly occurred throughout. Remains widespread in most national parks, game reserves and forest reserves and present in suitable habitat (i.e., *Brachystegia* woodland) outside conservation areas in Central and Northern regions. The main populations occur in Nyika National Park (about 5000), Vwaza Marsh Game Reserve (about 250), Kasungu National Park (about 1000), Nkhotakota Game Reserve (about 300), Liwonde National Park, Lengwe National Park (about 50), Majete and Mwabvi Game Reserves, Viphya Forest Reserve (common) and other forest reserves.

Habitat, Food & Reproduction: The reedbuck is a grazer of relatively poor quality short-medium height grassland. In *Brachystegia* woodland it commonly occurs in dambos and dambo margins, dispersing into the edge of the adjacent woodland at the height of the rains. On the Nyika plateau, reedbuck occur in high densities on the open grasslands; their movements are local but largely determined by the burning history, the highest densities occurring on recent burns (2–6 months) and gradually decreasing with the age of the burn. Reedbuck select for grass leaf from the relatively wiry grass types in which they occur and probably have a digestive specialisation (such as high throughput rate) for maintaining themselves on this rather poor quality diet.

Status: The reedbuck is a common animal in the conservation areas of Malawi and its survival is assured as long as these conservation areas are maintained. Most populations seem to be more or less stable, but the Nyika population has been steadily increasing since the original park was created in 1959, at a rate of probably at least 20% p.a. The central part of the Nyika plateau now supports a density of about 30 reedbuck per sq km, an unusually high density equivalent to some of the highest densities recorded (i.e., Dinder National Park, Sudan, and Eastern Shores Nature Reserve, Natal). This central sector may now have stabilised, but reedbuck densities in the peripheral parts of the plateau are still increasing. One of the consequences of the reedbuck population explosion on the Nyika is a high number of albinistic individuals (they are not full albinos). Pale specimens of *R. arundinum* are known only from Malawi and the immediately adjacent part of Eastern Zambia (Ansell 1988).

Conservation Measures Taken: The majority of reedbuck in Malawi are contained within conservation areas. They are subject to poaching, especially in the Nyika National Park, but are at least holding their own. It may be that the lower densities in the peripheral parts of Nyika are due to illegal offtake.

Conservation Measures Proposed: Proposals to improve the law enforcement capability in Nyika National Park are currently pending due to lack of funds.

Additional Remarks: No specific studies of reedbuck have been carried out in Malawi, but as the most numerous species of large mammal in the Nyika National Park, special attention is paid to it in the monitoring programme for that area.

Roan (*Hippotragus equinus*)

Distribution & Population: Probably occurred widely formerly, except for wetland areas and tall grass savanna of the lakeshore plain, and the lower Shire Valley in the south. The most southern definitely proven locality is the upper Namadzi River between Zomba and Blantyre (W.F.H. Ansell, in litt. 1/5/86). At present, roan occur in all national parks and game reserves in the Northern and Central regions, but are now absent from the Southern region. Total numbers are about 1900 and probably stable, including about 550–600 in Nyika National Park, about 700 in Vwaza Marsh Game Reserve, about 500 in Kasungu National Park, and about 100 in Nkhotakota Game Reserve.

Habitat, Food & Reproduction: Roan occur in *Brachystegia* woodland with short to medium height grass of medium quality, except on the Nyika plateau where they occur on short to medium height grassland. Analysis of their distribution in Kasungu National Park indicates a preference for gently undulating topography intermediate between that of sable and hartebeest. Roan avoid tall grass areas, but to a lesser extent than sable, a fact that presumably explains their wider distribution on a continental scale, and their ability to make use of open grasslands such as the Nyika, the Bangweulu floodplain (Zambia) and the Upper Nile floodplain (Sudan). The mean herd size is around 10 except on Nyika where groups of up to 40 are seen. Seasonal movements involve dispersal in wooded interfluve areas during the rains and concentration in burnt dambos in the dry season. On Nyika, roan concentrate on the high plateau during the rains and disperse into the upper escarpments during the cold dry weather from June–September. Roan are predominantly grazers but have been seen to take occasional browse in the dry season. On Nyika, they are commonly seen feeding on submerged water weeds in ponds and dams. Calving takes place in the dry season from about July to September.

Status: All roan in Malawi are confined to national parks or game reserves; at present they are not a prime poaching target although they are killed regularly in all areas. The populations are probably secure as long as the conservation areas are maintained. The Nyika population seems to be slowly increasing and may continue to do so following the extension of the park in 1978. The Vwaza Marsh Game Reserve population may also increase following the gazettement of the reserve in 1978 and the recent upgrading of law enforcement in the area. The Nkhotakota population is probably well below carrying capacity on account of illegal offtake.

Conservation Measures Taken: All roan in Malawi occur in conservation areas. Law enforcement is relatively effective but could be improved, particularly in Vwaza Marsh Game Reserve and Nkhotakota Game Reserve.

Additional Remarks: Roan antelope is a characteristic species of the conservation areas in Malawi apart from the Southern region. They are easily seen in Vwaza Marsh Game Reserve and Kasungu National Park and are a prominent feature of the Nyika grasslands. A study of the feeding ecology and behaviour of roan in Malawi would be a worthwhile project. The population of about 550 on the Nyika plateau grasslands deserves special attention because of its relatively high density, unusual open habitat and ease of visibility and access. Although roan have not been specifically studied in Malawi, the populations in Kasungu and Nyika National Parks are included in the general monitoring programmes for those areas.

Sable (*Hippotragus niger*)

Distribution & Population: Probably occurred throughout formerly, except for highland and wetland areas and tall grass savanna, i.e., lakeshore plain and lower Shire Valley floor. Currently occurs in most of the national parks, all of the game reserves and some forest reserves, including Vwaza Marsh Game Reserve (about 20), Kasungu National Park (about 500), Nkhotakota Game Reserve (about 250), Liwonde National Park (about 900), Majete Game Reserve (about 100), Lengwe National Park (occasional

reports), Mwabvi Game Reserve (about 200), Namizimu and Dzalanyama Forest Reserves. Total numbers are about 2000 and probably stable.

Habitat, Food & Reproduction: Most sable habitat consists of mature *Brachystegia* woodland with an understorey of short grass of medium quality. Analysis of sable distribution in Kasungu National Park indicates a preference for more steeply undulating topography in contrast to roan and hartebeest. This agrees with observations by Rodgers in the Selous Game Reserve, Tanzania. In the dry season sable move onto green flushes in burnt dambos. The habitat of the Liwonde population is mainly tall mopane with short grass. In the dry season, many of the Liwonde sable move out of the mopane onto the edge of the Shire River floodplain, where they concentrate in herds of up to 100. The sable is a short grass grazer, mainly concentrating on grass from 10–30 cm high, as reported by Grobler (1974) in Zimbabwe. Calving takes place in the dry season from about July to September, implying a conception peak from about September to November.

Status: Nearly all the sable in Malawi are confined to conservation areas, and at present they are not a prime poaching target although they are killed quite frequently, particularly in Kasungu National Park. In most areas, their status is probably stable as long as the conservation areas are maintained. The population in Mwabvi Game Reserve is probably declining following the recent re-opening of 60% of the reserve area and the return of settlement. The population in Liwonde National Park is probably still increasing following the creation of the park in 1975.

Conservation Measures Taken: Law enforcement within conservation areas is reasonably effective by comparison with neighbouring countries, but an appreciable illegal offtake of sable occurs, particularly in Nkhotakota Game Reserve, Majete Game Reserve, Mwabvi Game Reserve and the forest reserves.

Additional Remarks: Sable is the most characteristic antelope of Malawi, being relatively common and occurring in all the national parks and game reserves except the Nyika and the new Lake Malawi National Park. The population in Liwonde National Park is of particular interest, with one of the highest densities on record (1.7 per sq km) and with its large herd size (several herds of over 50) and easy visibility. Sable have not been specifically studied in Malawi, but the population in Kasungu National Park is included in the general monitoring programme for that area.

Blue Wildebeest (*Connochaetes taurinus*)

Distribution & Population: The Nyassa wildebeest (*C. t. johnstoni*) formerly occurred in Malawi. It was probably confined to the sodic flats surrounding Lake Chilwa, i.e., the Palombe plains. It is doubtful if the species ever occurred in what is now Liwonde National Park, since the habitat is generally unsuitable. The Nyassa wildebeest was exterminated in Malawi in the 1930s and the Palombe plains are now densely settled.

The Nyassa wildebeest survives in northern Mozambique and southern Tanzania. Occasional reports have been made of wildebeest in Kasungu National Park, although none have been seen within the last 9 years. These sightings, if accurate, are presumably of *C. t. cooksoni* having wandered up from the Luangwa Valley in Zambia. The habitat in Kasungu National Park is completely unsuited to wildebeest and the dispersal shows no signs of establishing a viable population. There is also an old record of wildebeest (presumably *cooksoni*) in the area of the present Vwaza Marsh Game Reserve (Ansell 1982).

Status: The wildebeest is currently extinct in Malawi.

Conservation Measures Taken: Nil.

Conservation Measures Proposed: Proposals have been put forward from time to time to re-introduce the Nyassa wildebeest from Mozambique or Tanzania to Liwonde National Park. Our view is that this would be a wasted effort since the habitat in Liwonde is probably unsuitable for wildebeest and there is no hard evidence that they occurred there in the past. The creation of a conservation area in suitable habitat on the Palombe plain is probably now impossible on account of the high human density there. In conclusion we must probably resign ourselves to the loss of this member of Malawi's fauna.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Population: Probably occurred formerly throughout the *Brachystegia* woodland parts of the country. Now mainly confined to Vwaza Marsh Game Reserve (population about 700) and Kasungu National Park (about 400), with occasional sightings in the Nyika and Lengwe National Parks, Nkhotakota, Majete and Mwabvi Game Reserves. Total numbers are about 1100 and stable in the two main populations.

Habitat, Food & Reproduction: Lichtenstein's hartebeest is one of the most characteristic species of the miombo woodland of the central African plateau. It is largely confined to mature *Brachystegia* woodland with a ground cover of short to medium grass of medium to poor quality. It appears to prefer the flatter areas which have a tendency to seasonal waterlogging. Analysis of hartebeest distribution in Kasungu National Park indicates a preference for very flat topography in contrast to sable and roan. This agrees with the observations of Rodgers in the Selous Game Reserve, Tanzania. In Kasungu National Park, this species shows strong avoidance of the longer grass areas, so that its distribution is highly correlated with the extreme 'plateau' landform (cf. Bell 1981c). With its long narrow snout, this species is probably capable of selecting leaf from the fine wiry grasses in its preferred habitat. It may also have digestive specialisations that allow it to make use of leaves of relatively low quality.

Vrba (1979 and personal communication) believes that this species is distinct from the other hartebeests and resembles them through parallel evolution. She accepts *Sigmoceros* Heller, 1912 as a valid genus for *lichtensteinii*. It differs from the other hartebeests in being a woodland as opposed to a mainly grassland species and occurring in moist oligotrophic as opposed to semi-arid eutrophic conditions. Mean group size is about 8. Seasonal movements involve local movement into interfluve woodlands during the rains and onto burnt dambos in the dry season. Calving takes place in the dry season with a peak in August.

Status: Nearly all the Lichtenstein's hartebeest in Malawi occur in conservation areas, with the great majority in Vwaza Marsh Game Reserve and Kasungu National Park. These populations are safe as long as the conservation areas are maintained. The occasional sightings in the other areas probably represent animals in marginal habitat whose status is dubious. Hartebeest are occasionally killed by poachers but are not a prime target.

Conservation Measures Taken: Most of the hartebeest in Malawi are in conservation areas, with a few exceptions around the edges of Kasungu National Park. Law enforcement is relatively effective but could be improved, particularly in Vwaza Marsh Game Reserve. A nucleus of Lichtenstein's hartebeest was recently translocated from Kasungu National Park to Kruger National Park in South Africa in an attempt to establish a population there (see chapter 10).

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Formerly, probably occurred throughout wherever suitable rocky outcrops occur. Such outcrops are very common throughout Malawi, except on the alluvial lakeshore plain and floor of the lower Shire Valley. At present, klipspringer are common on suitable rocky outcrops in all national parks and game reserves, many forest reserves and some open areas. Specific areas where they are known to occur include

Nyika National Park (rocky outcrops throughout grasslands and wooded foothills), Vwaza Marsh Game Reserve (hilly areas in eastern half of the reserve), Kasungu National Park (rocky outcrops throughout), Nkhotakota Game Reserve (rocky outcrops throughout), Lake Malawi National Park (rocky outcrops throughout mainland and Domwe Island; status on other islands unknown), Liwonde National Park (Jinguni Hill), Majete Game Reserve (rocky outcrops throughout), Lengwe National Park (rocky outcrops in northwestern extension), and Mwabvi Game Reserve (rocky outcrops throughout). Population sizes are probably small, numbering in the low hundreds in most conservation areas.

Habitat, Food & Reproduction: No special information available.

Status: The status of the klipspringer in Malawi is secure for the foreseeable future. There is some confusion as to the precise taxonomic status of the populations in Malawi. The subspecies are currently under review (Ansell, personal communication).

Conservation Measures Taken: Well represented in protected areas.

Oribi (*Ourebia ourebi*)

Distribution & Population: Formerly, probably widespread in relatively high quality areas such as valley areas of the central African plateau and the Rift Valley. There are no records of oribi within Malawi north of about 12°45'S or south of about 15°45'S (W.F.H. Ansell, in litt. 1/5/86).

Oribi now appear to be confined to Kasungu National Park and Liwonde National Park. In Kasungu, they are commonly seen in pairs or groups of 3 along the more eutrophic valley slopes of the major dambos, particularly after burning in the dry season. The total population might amount to 200–500 individuals. In Liwonde they are relatively uncommon (although they may be increasing) and are probably confined to the northern part of the park. The total is probably less than 200.

Habitat, Food & Reproduction: The ecology of oribi is somewhat obscure. In many areas, the species is very common in areas of short to medium sour grassland on floodplain margins. Examples are the margins of the Bangweulu floodplains in Zambia and the upper Nile floodplains in Sudan, where oribi reach high densities. This contrasts with the distribution of the species in Malawi where it is confined to relatively eutrophic areas, as it is in the Serengeti, where it is common. Perhaps oribi is a specialist on the short, nutrient rich grasses that occur on and around termitaria, which appear to be a common feature of areas where oribi are abundant.

Status: Oribi are probaby secure in both Kasungu and Liwonde National Parks as long as these protected areas are maintained. A potential problem may exist in the form of genetic isolation and small population sizes.

Conservation Measures Taken: All oribi in Malawi are probably confined to conservation areas.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Formerly, probably occurred throughout except in wetland areas and high altitude grasslands. Remains common in all national parks and game reserves except Nyika plateau grasslands. Occasionally reported in *Brachystegia* woodlands of Nyika foothills, but status needs to be checked. Probably common in most forest reserves other than montane grasslands, and in other wooded areas with relatively sparse settlement.

Habitat, Food & Reproduction: This small browser is common in most of Malawi's protected areas, particularly in the more eutrophic areas such as Vwaza, the Kasungu valleys, Liwonde and Lengwe. It is present but scarce throughout the central African plateau *Brachystegia,* relatively rare in escarpment *Brachystegia* (Nyika foothills, Nkhotakota, Majete), and possibly absent from the Nyika grasslands (except perhaps at forest patch edges).

Status: Secure in protected areas.

Conservation Measures Taken: Well represented in conservation areas.

Suni (*Neotragus moschatus*)

Distribution & Population: Formerly, probably occurred mainly in the dry deciduous thicket areas in the Shire Valley. It was also present formerly in the Shire highlands around Blantyre (W.F.H. Ansell, in litt. 1/5/86). The suni is now probably confined to the dry deciduous thicket areas in Lengwe National Park and Mwabvi and Majete Game Reserves. It is common in the thicket and thicket clump sector of Lengwe National Park. The population may number at least several hundred individuals. On a 7 km night drive it is normal to see at least 20 suni. A recent ground strip census exercise resulted in an estimate of 2110 suni in Lengwe (S.M. Munthali, unpublished). No estimate of suni numbers is available for Mwabvi Game Reserve. The species is reported occasionally in Majete Game Reserve.

Habitat, Food & Reproduction: Suni are mainly confined to areas of dry deciduous thicket or the bush clump zone around it. The suni is primarily a browser but has occasionally been seen to take small green grass leaves. It frequently takes fallen leaves in the dry season.

Status: The status of suni in Malawi is probably secure, at least as long as Lengwe National Park is maintained. However, some concern has been expressed (cf. Bell 1981a) about the effect of the increase in the nyala population on the habitat and hence population of suni. There is some evidence that the density of suni may have declined in the high density nyala area in the last 10 years. This has been used as an argument in favour of culling nyala in this area.

Conservation Measures Taken: All suni in Malawi are probably confined to conservation areas. Suni are probably not seriously at risk from poaching. The population in Mwabvi Game Reserve may be affected by the re-opening of 60% of the Game Reserve area to settlement, but most of the suni habitat is within the remaining part of the reserve.

Conservation Measures Proposed: The primary concern over the status of suni in Malawi relates to the possible effect of the increase in nyala on the habitat of suni in Lengwe National Park. A reduction cull of nyala has been implemented. In addition, the suni population at Lengwe will be monitored as far as possible.

Impala (*Aepyceros melampus*)

Distribution & Population: Formerly, probably occurred throughout apart from montane and wetland areas. Impala now occur in Vwaza Marsh Game Reserve (population 600), Kasungu National Park (about 100), Nkhotakota Game Reserve (occasional reports), Liwonde National Park (>300), Lengwe National Park (at least 200), Majete Game Reserve (occasional sightings), and Mwabvi Game Reserve (about 50). The total population is about 1200 and increasing.

Habitat, Food & Reproduction: Impala occur in a wide variety of habitats, but evidently do not perform well in low nutrient status areas such as *Brachystegia* woodland. In Kasungu National Park they are largely confined to the higher quality tall grass *Terminalia-Combretum* savanna valley areas, while the two larger populations, in Vwaza and Liwonde, occur in mixed woodland with *Acacia* and *Albizzia* spp. and mopane, and high quality grasses. The same is true of the Lengwe and Mwabvi populations. Impala is well known as a mixed feeder with a very variable diet. In Malawi it is probably primarily a grazer taking a proportion of browse in the dry season. Calving usually takes place in the early rains with a peak around the New Year.

Status: Although the populations of impala in Malawi are small, most of them appear to be increasing quite rapidly; this is evident from the steady increase in sighting rate and range in most areas. Presumably the reason is that impala occupy areas that were favoured for settlement prior to creation of the conservation areas, and so were eliminated or reduced to very low numbers and have taken a relatively long period to return by dispersal and recover in numbers. This is most clear in Lengwe and Vwaza where impala are now increasing at around 20% p.a. and may in the long run outnumber nyala, as they do in similar situations in Natal (i.e., Mkuzi). In general, the future of impala in Malawi may be considered secure as long as the conservation areas are maintained.

Conservation Measures Taken: All impala in Malawi are contained within conservation areas. They suffer to some extent from poaching but are not a prime target.

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References

Anderson, J.L. 1978. Aspects of the ecology of the nyala (*Tragelaphus angasi* Gray 1849) in Zululand. Ph.D. thesis, University of London. 425 pp.

Ansell, W.F.H. 1981. The range of the nyala in Malawi. *Nyala 7*(2): 85–90.

Ansell, W.F.H. 1982. Some mammal species absent from or marginal to Malawi. *Nyala 8*(1): 23–29.

Ansell, W.F.H. 1988. Mammals from Malawi part II. *Nyala* (in press).

Bell, R.H.V. 1981a. Notes on the nyala situation and discussion of management options. Report to the Malawi Government. 35 pp.

Bell, R.H.V. 1981b. An estimate of nyala numbers in Lengwe National Park by estimating the drinking rate of naturally recognisable animals. Report to the Malawi Government. 24 pp.

Bell, R.H.V. 1981c. An outline of a management plan for Kasungu National Park. *In* Jewell, P.A.; Holt, S.; Hart, D. (Editors). Problems in management of locally abundant wild animals, pp. 69–89. New York, Academic Press.

Bell, R.H.V.; Dudley, C.O. 1982. Two methods of estimating nyala (*Tragelaphus angasi* Gray) populations in Lengwe National Park, Malawi. *Nyala 8*(1): 5–16.

Bell, R.H.V.; McShane-Caluzi, E. (Editors). 1986. Conservation and wildlife management in Africa. Washington DC, US Peace Corps.

Bell, R.H.V.; Nsamjama, H. 1985. Male puku for Malawi. *Swara 8*(4): 23–24.

Clarke, J.E. 1983. Master Plan for national parks and wildlife management. 4 vols. Lilongwe, Department of National Parks & Wildlife.

Clarke, J.E.; Bell, R.H.V. 1986. Representation of biotic communities in protected areas: a Malawian case study. *Biological Conservation 35:* 293–311.

Dowsett-Lemaire, F. 1988. Fruit choice and seed dissemination by birds and mammals in the evergreen forests of upland Malawi. *La Terre et la Vie 43:* 251–286

Evans, P.G.H. 1979. Habitat preferences of ungulates in closed savanna of central Africa. *Mammal Review 9:* 19–32.

Grobler, J.H. 1974. Aspects of the biology, population ecology and behaviour of the sable *Hippotragus niger niger* (Harris, 1838) in the Rhodes Matopos National Park, Rhodesia. *Arnoldia 7*(6): 1–36.

Hutson, J. 1977. The Lengwe game counts 1967–1977. *Nyala 3*(2): 14–25.

McShane, T.O. 1985. Vwaza Marsh Game Reserve, a baseline ecological survey. Lilongwe, Department of National Parks & Wildlife.

Mill, T.A. 1979. The ecology of the Nyika National Park, Malawi. M.Sc. thesis, University of Calgary.

Mphande, J.N.B.; Jamusana, H.S. 1986. Culling of nyala antelopes in Lengwe National Park, Malawi. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 255–277. Washington DC, US Peace Corps.

Ridding, C.J. 1975. Report on Mwabvi Game Reserve, southern Malawi. Report to the Ministry of Agriculture and National Resources, Lilongwe. 41 pp.

Vrba, E.S. 1979. Phylogenetic analysis and classification of fossil and recent Alcelaphini. Mammalia: Bovidae. *Biological Journal of the Linnean Society 11:* 207–228.

Chapter 6: Mozambique

J.L.P. Lobao Tello

Introduction

Mozambique comprises a low-lying coastal plain and extensive inland savanna-covered plateau. A branch of the Rift Valley extends southward from the Lake Malawi trough to reach the Indian Ocean in Sofala Province. Large areas of Mozambique's savanna zones are thinly populated by humans and there is little pressure on these natural environments from agricultural development, but uncontrolled slaughter of the country's wildlife over the last 70–80 years has led to a severe decline in the populations of antelopes and other large wild animals. Many species have been eradicated totally from extensive regions of the country.

Enforcement of conservation laws and control of poaching have often been precluded by such factors as the size of the country, the prolonged struggle for independence from colonial rule, and continuing armed strife. Encouraging developments in wildlife conservation in the 1970s (Tinley et al. 1976) received Government support following independence, but have not been consolidated. Although hunting is legally closed, the laws are often ignored and hunting for meat and the illegal trade in wildlife products are practised widely by all sectors of society, including military personnel, rural people and anti-government rebels. Nevertheless, there have also been some encouraging developments in wildlife conservation, such as the establishment of the Zambezi Valley Wildlife Utilization Unit.

Current Status of Antelopes

"Miombo," a woodland association dominated by *Brachystegia/Julbernardia* species, is the most widespread savanna type in Mozambique. There are also extensive areas of mopane (*Colophospermum/Commiphora*) savannas, and mosaics of *Acacia,* broadleaf (*Terminalia/Pterocarpus/Combretum*) and mopane savannas (Fig. 1). Antelopes associated with these savannas include eland, greater kudu, grey duiker, waterbuck, sable, roan, Lichtenstein's hartebeest and impala. The coastal strip of tropical forest and/or thicket mosaics (Fig. 1) is inhabited by red duiker, suni and bushbuck; these species plus nyala and Sharpe's grysbok occur in forest and thicket habitats within the savanna zones. Extensive floodplain grasslands, notably in the Rift Valley and

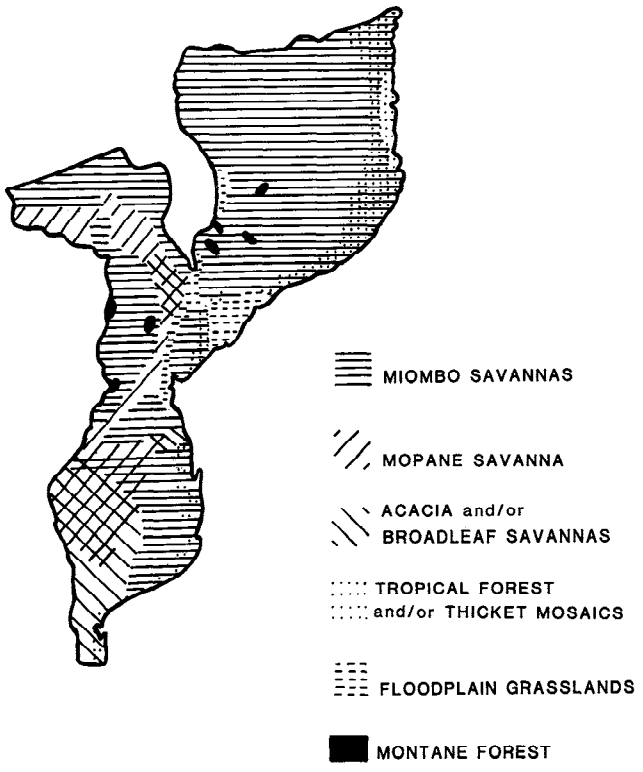

Fig. 1. Approximate major vegetation zones of Mozambique (after Tinley, in Smithers & Tello 1976).

Zambezi Valley and Delta, support large concentrations of grazing species such as wildebeest, southern reedbuck and waterbuck, plus zebra, hippopotamus and buffalo. Blue duiker occurs in montane forests.

The decimation of Mozambique's wildlife by such factors as former large-scale destruction for control of tsetse fly and continuing uncontrolled hunting, has had a serious effect on the antelope fauna. Antelopes are also threatened in some areas of the country by destruction of natural habitats. Examples include agricultural development of floodplain grasslands, reduction of tropical forests to small, isolated relics by shifting cultivation (especially in Manica and Sofala Provinces and the coastal region south of the Save River), and similar devastation of montane forests. Almost half of the 22 antelope species which occur in Mozambique may now be threatened to some degree (Table 1), whereas in the mid-1970s, roan, tsessebe and mountain reedbuck were the only species regarded as endangered, vulnerable or rare (Bothma 1975). The species classed as vulnerable in Table 1 still exist in substantial remnant populations and are not immediately threatened, but their overall numbers are declining.

Conservation Measures Taken

Mozambique has nine proclaimed national parks and reserves (Fig. 2), and many other areas which are worthy of conservation action (Tinley et al. 1976). Gorongosa National Park, the best-known internationally, was proclaimed a game reserve in the 1920s and 30s by the Portuguese administration and a national park in 1960. It includes floodplain grasslands on the floor of the Rift Valley which support one of the two greatest wildlife concentrations remaining in the country, with thousands of wildebeest, waterbuck, oribi, zebra (*Equus burchelli*), elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*) and hippopotamus (*Hippopotamus amphibius*). This national park also contains *Brachystegia* woodland and *Acacia* savanna, and supports major

Table 1
Current Status of Antelopes in Mozambique

Species	Status*	Species	Status
Bushbuck	S	Roan	En
Nyala	S	Sable	V
Common Eland	V	Blue Wildebeest	V
Sitatunga	R	Lichtenstein's	
Greater Kudu	S	Hartebeest	V
Blue Duiker	K	Tsessebe	Ex
Natal Red Duiker	S	Klipspringer	S
Grey Duiker	S	Oribi	S
Waterbuck	V	Steenbok	S
Southern Reedbuck	S	Sharpe's Grysbok	S
Mountain Reedbuck	En	Suni	S
		Impala	S

* Ex = extinct; En = endangered; R = rare; V = vulnerable; K = insufficiently known; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

populations of bushbuck, nyala, eland, sable, Lichtenstein's hartebeest and impala.

Marromeu Game Reserve comprises floodplain grasslands with forest/savanna mosaics on higher ground in the southern part of the Zambezi Delta. It has the other remaining large concentration of wildlife, including buffalo and grazing antelopes such as waterbuck, southern reedbuck and oribi. The Zambezi Wildlife Utilization Unit extends from Gorongosa National Park to the Marromeu Reserve, which is incorporated within the Unit. This Unit comprises a similar range of habitats to Gorongosa, including floodplains and associated savannas and forests, with miombo woodland on higher ground. In addition to floodplain species, it contains important populations of eland, red and grey duikers, sable and hartebeest.

Zinave National Park, bounded on the north by the Save River, lies in a transitional zone between the relatively arid southern zone of Mozambique and the moister environments of the central and northern regions. It includes mopane, *Brachystegia, Acacia* and broadleaf savannas. Banhine National Park is in the most arid part of Mozambique (annual rainfall less than 400 mm) and features open grassland plains and mopane and broadleaf savannas. Niassa and Gile Game Reserves are dominated by *Brachystegia/Julbernardia* savannas intersected by numerous seasonally flooded grasslands (dambos). Maputo Game Reserve in the southern coastal region contains a variety of habitats, including forest, savanna, lakes, floodplains and open grasslands. Pomene Game Reserve also contains coastal habitats.

These conservation areas have suffered to varying degrees from poaching and invasion by cultivators and cattle. The Wildlife and Forestry Department suffers from severe shortages of manpower and equipment, and has been unable to control much of this illegal activity. By 1980, Gorongosa National Park was the only fully staffed conservation area in the country and even there the position was worsening with a lack of essential equipment and spare parts. Inadequate protection has allowed widespread poaching to occur. Among the national parks, Banhine and Zinave have been affected especially severely. Parts of Maputo Game Reserve were occupied by large numbers of illegal settlers in the early 1980s.

Despite these adverse trends, evidence of a recent change in attitude towards wildlife conservation by provincial governments and rural populations is provided by the establishment of the Zambezi Valley Wildlife Utilization Unit. Effective protection of this Unit allowed its wildlife populations to increase markedly between the mid-1970s and 1982. Since then, guerilla activity has precluded effective control of poaching in parts of this Unit.

Re-establishment of good protection and management will allow the wildlife populations to recover quickly.

A wildlife utilization unit has also been established in the Limpopo Valley. This area supports substantial populations of nyala, grey duiker, steenbok and impala.

Conservation Measures Proposed

Mozambique's antelope fauna is an important part of the country's natural heritage, and a valuable natural resource with the potential to make a significant contribution to development, e.g., through protein production on marginal lands and, in the longer term, tourism. Re-establishment of effective protection and management of the proclaimed conservation areas (Fig. 2), which provide the basis of a representative system, should be an initial priority. This will require substantial financial inputs to increase the numbers of trained personnel and equipment to adequate levels. Conservation education programmes are also essential to enhance awareness of the value of wildlife conservation among rural people, government officials, and decision makers.

International assistance will be necessary to achieve improved conservation. The Government of Mozambique is faced with much greater problems than wildlife conservation, ranging from the effects of drought and food shortages to armed insurrection. Renewed appreciation of wildlife as a natural resource of potentially great economic and recreational value to Mozambique's future will be essential if the decline of the country's antelope fauna is to be arrested before it becomes catastrophic.

Species Accounts

A detailed account of the status of antelopes and other wildlife in Mozambique is given by Tello (1986). Brief summaries of what is known about the current status of antelope species are presented here. Detailed descriptions of the habitats of antelopes and other wildlife species were given by Smithers & Tello (1976).

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Widely distributed in suitable habitat such as forest fringes and thickets (Fig. 3), although locally absent in areas of unsuitable habitat. Numbers unknown, but common in many areas, such as the Zambezi and Limpopo Valleys, southern Manica Province, coastal districts of Cabo Delgado Province, and along the lower Lugenda River. Rare in the drier parts of southern Mozambique and endangered in Maputo Province.

Status: Not threatened. The bushbuck's secretive habits and preference for thick cover enable it to withstand considerable hunting pressure. Unlike many other antelope species, it still occupies much of its original range.

Conservation Measures Taken: Occurs in all proclaimed conservation areas except Banhine and Bazaruto National Parks. Abundant in Niassa Game Reserve, Gorongosa National Park, Zambezi Valley Wildlife Utilization Unit, and in the Save Valley within Zinave National Park. Common but decreasing in Gile Game Reserve. Rare in Pomene and Maputo Game Reserves.

Nyala (*Tragelaphus angasii*)

Distribution & Population: Occurs in parts of central and southern Mozambique (Fig. 3). The total population is much reduced but may exceed 10000. The largest numbers occur in Gorongosa National Park and adjacent parts of Sofala Province, with smaller numbers in Maputo (increasing on cattle farms in the southwest where scrub and thicket have invaded—this population was about 1000 in 1983—but endangered elsewhere), Gaza

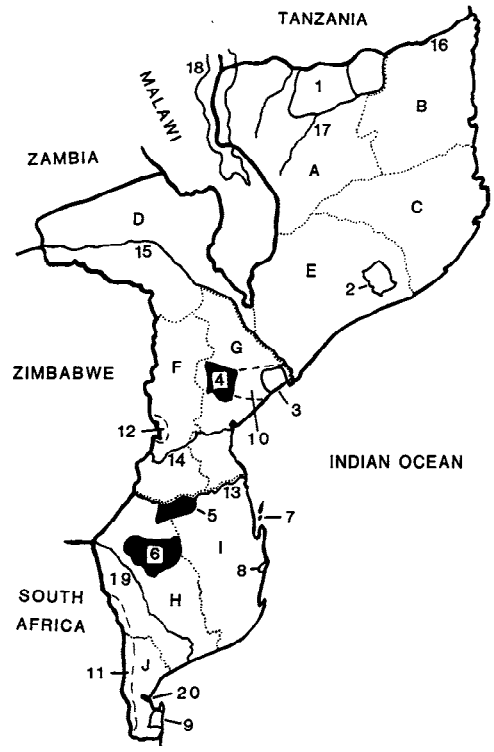

Fig. 2. Proclaimed conservation areas and provinces of Mozambique. Conservation areas: 1: Niassa (=Rovuma) Game Reserve (10500 sq km). 2: Gile Game Reserve (2100 sq km). 3: Marromeu Game Reserve (1500 sq km). 4: Gorongosa National Park (3770 sq km). 5: Zinave National Park (5000 sq km). 6: Banhine National Park (7000 sq km). 7: Bazaruto National Park (150 sq km). 8: Pomene Game Reserve (1000 sq km). 9: Maputo Game Reserve (800 sq km). 10: Zambezi Valley Wildlife Utilization Unit (14700 sq km). Other areas: 11: Lebombo Mountains. 12: Chimanimani Mountains. 13: Save River. 14: Buzi River. 15: Zambezi River. 16: Rovuma River. 17: Lugenda River. 18: Lake Malawi. 19: Limpopo River. 20: Maputo. Provinces: A: Niassa. B: Cabo Delgado. C: Nampula. D: Tete. E: Zambezia. F: Manica. G: Sofala. H: Gaza. I: Inhambane. J: Maputo.

(common in the Limpopo Valley), Inhambane (very rare outside Zinave National Park), and Manica Provinces.

Status: Not threatened. Numbers are declining in many areas because of uncontrolled hunting, but sufficient nucleus populations remain in some conservation areas to ensure the species' long-term survival if improved management of these areas can be effected.

Conservation Measures Taken: In 1980 the nyala population of Gorongosa National Park was estimated to be 3–5000, mainly in the northern, eastern and central areas of the park. Since 1980, numbers may have been reduced substantially in the eastern sector of this park. Formerly abundant in parts of Zinave National Park, where the population may have been reduced to <500 by poaching. On the verge of extinction in Maputo Game Reserve and Banhine National Park.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: This species' range is steadily contracting, but it still occurs widely at low densities except in the south of the country (Fig. 3). The total population is probably no more than a few thousand individuals, with the largest numbers within the conservation areas in northern Sofala Province. Elsewhere numbers are generally moderate to low, e.g., in Tete, Zambezia and Nampula Provinces, or very low, e.g., in northwestern Inhambane Province (probably endangered), and in the Limpopo Valley Wildlife Utilization Unit (population perhaps 50) and else-

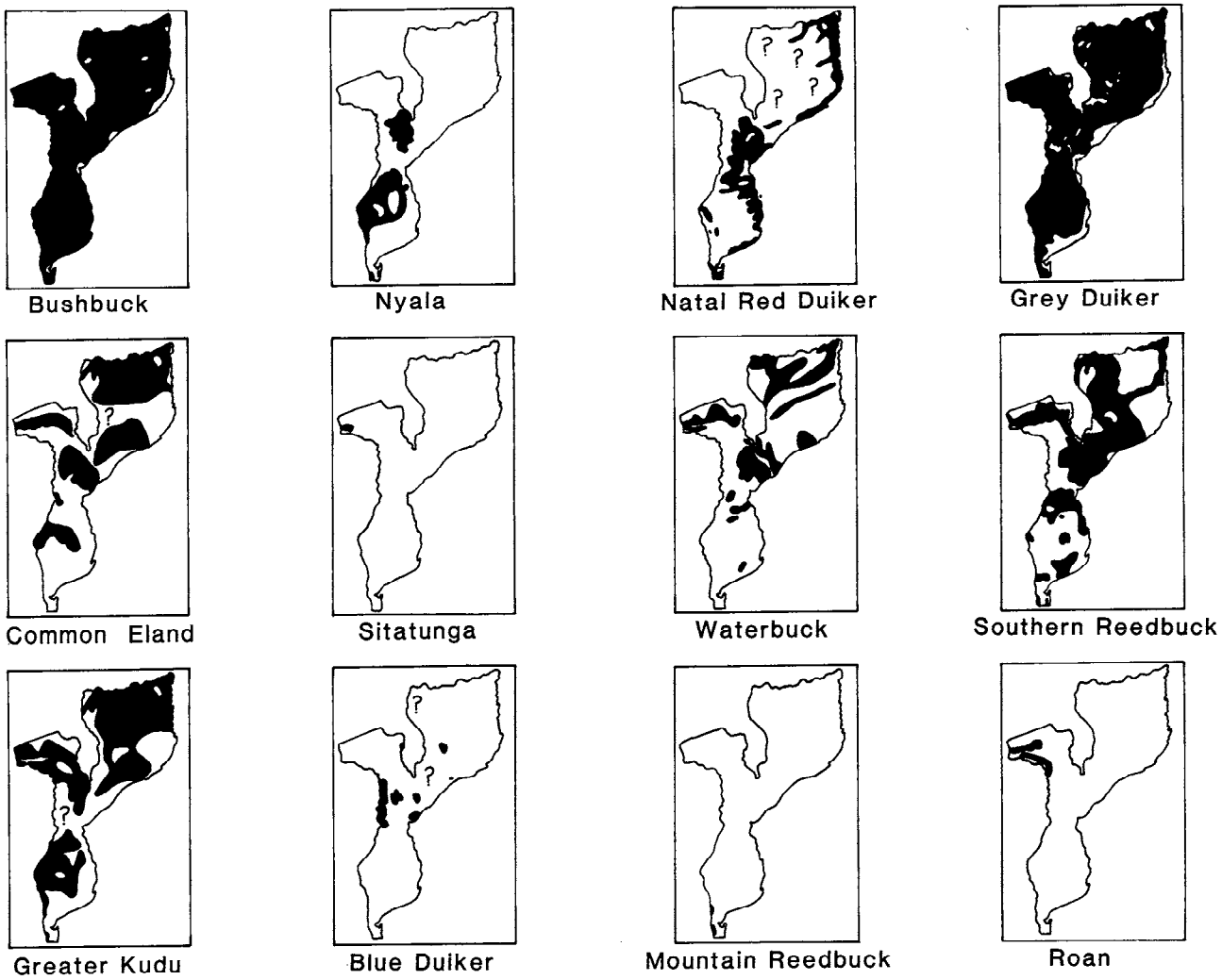

Fig. 3. Present known distributions (approximate) of antelopes in Mozambique (see Tello (1986) for greater details). Question marks indicate areas where a species probably occurs but is not definitely known to be present. For tsessebe, broken lines indicate areas which were occupied within the last 10-20 years.

where in northern Gaza Province. Seasonal movements of eland occurred between Gaza Province and the Kruger National Park across the South African border until the erection of the Kruger Park game fence.

Status: Vulnerable, in view of its relatively small numbers and its steady decline throughout most of its range in Mozambique (Smithers & Tello 1976), but not in immediate danger. At present, the species is probably secure in Gorongosa National Park, Zambezi Valley Wildlife Utilization Unit, Chimanimani Ridge and the northern areas of Manica Province, Niassa Game Reserve, and Cabo Delgado Province.

Conservation Measures Taken: Populations of several hundred occur in Gorongosa National Park and the Zambezi Valley Wildlife Utilization Unit. Eland undertake seasonal movements in and out of these conservation areas. The population of Gorongosa National Park does not appear to have been affected greatly by poaching. In Zinave National Park the population was <100 in the early 1970s and is probably now endangered. Eland also occur in Niassa (about 200) and Gile (<100) Game Reserves.

Sitatunga (*Tragelaphus spekii*)

Distribution, Population & Status: A small, isolated population probably still occurs on the Zambezi River in western Tete Province (Fig. 3). Numbers may be <50. Status probably rare; does not occur in any conservation area.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Although its range has contracted considerably, the kudu remains widespread (Fig. 3). Total numbers unknown, but probably declining. Still common in some areas, e.g., parts of Cabo Delgado, Niassa, Tete, Sofala and Gaza Provinces, but has been reduced to small relic populations in others, e.g., Nampula, Zambezia and Maputo Provinces.

Status: Not threatened. In areas with suitable cover of woody vegetation it is able to withstand hunting pressure better than large antelopes of more open habitats.

Conservation Measures Taken: Occurs in Gorongosa (population estimated to be 350–500 in 1980 and apparently not seriously affected by poaching), Banhine (uncommon), and Zinave (numbers greatly reduced by poaching) National Parks, and Niassa (population about 4000 in 1977 and present in good numbers in 1980–82) and Gile (very few) Game Reserves.

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Occurs locally in montane forest, coastal scrub and thicket, mainly in Manica and Sofala Provinces (Fig. 3). Probably occurs in several areas of northern Mozambique where it has not yet been recorded definitely. Numbers unknown, but common on Gorongosa Mountain and the Chimanimani Mountains.

Status: Although it is common locally, this duiker's survival

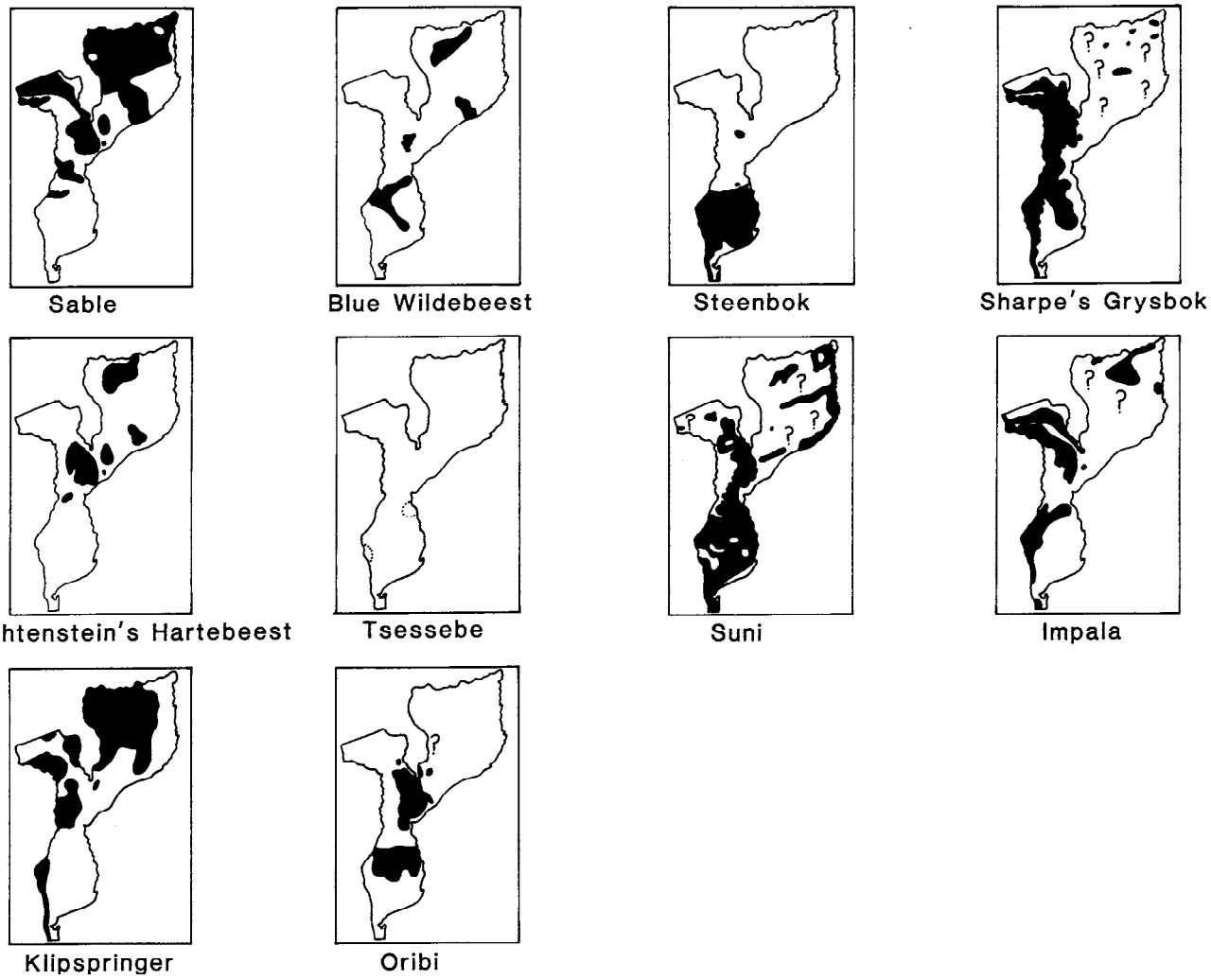

Fig. 3. Present known distributions of antelopes in Mozambique—continued.

is threatened by destruction of its habitat by shifting cultivation in some localities, e.g., Gorongosa Mountain.

Conservation Measures Taken: Occurs rarely in riverine forests in the north of Gorongosa National Park and in semi-deciduous lowland forest in the Zambezi Valley Wildlife Utilization Unit.

Natal Red Duiker (*Cephalophus natalensis*)

Distribution & Population: Occurs from Maputo Province northwards in the eastern and central parts of the country to the Zambezi River; north of the Zambezi, occurs along the coastal strip from eastern Zambezia to eastern Cabo Delgado and probably in parts of the interior (Fig. 3). Numbers unknown, but common to abundant within suitable habitat of tropical forest and thickets in much of its range, despite being trapped widely for meat.

Status: Not threatened.

Conservation Measures Taken: Occurs in Gorongosa National Park (common in thickets and riverine forests of the miombo area), Zinave National Park (rare), Bazaruto National Park (which is on Santo Antonio Island, about 10 km off the mainland), Zambezi Valley Wildlife Utilization Unit (common), Pomene Game Reserve, Limpopo Valley Wildlife Utilization Unit (rare), and Maputo Game Reserve (abundant).

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Widespread throughout, except for local areas of unfavourable habitat (Fig. 3). Numbers unknown, but common in suitable habitat over most of its range.

Status: Not threatened. Persists even in some intensively developed areas with sufficient cover.

Conservation Measures Taken: Occurs in most of the proclaimed conservation areas. Abundant in Banhine National Park in 1980, and in the Limpopo Valley Wildlife Utilization Unit, Niassa and Gile Game Reserves. Common in Zinave National Park, and the miombo woodland sections of Gorongosa National Park and the Zambezi Valley Wildlife Utilization Unit. Numbers decreasing in Maputo Game Reserve.

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: Formerly widespread, but now reduced to scattered remnant populations (Fig. 3). Extinct in Maputo Province, and on the verge of extinction in Gaza, Inhambane, Tete, and southern Sofala and Manica Provinces. Small numbers survive in Niassa, Cabo Delgado and Zambezia. The largest surviving population is in northern Sofala Province. The total population probably exceeds 10 000, with well over 90% in the conservation areas of northern Sofala.

Status: Vulnerable, in view of the more or less continuous decline in its numbers over most of the country (Smithers & Tello 1976), although viable populations persist in Marromeu and Gorongosa.

Conservation Measures Taken: Occurs in large numbers in and around Marromeu Game Reserve within the Zambezi Valley Wildlife Utilization Unit, and in substantial numbers (about 2000) in Gorongosa National Park, where it does not appear to have been much affected by poaching. Occurs in small numbers in

Niassa Game Reserve (1–200), Gile Game Reserve (endangered), and Zinave National Park (population about 600 in 1972, but now greatly reduced and in danger of extinction if the park is not soon reoccupied by well equipped and well motivated Wildlife staff).

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: This species' range has contracted considerably, but it still occurs widely in the central and northern regions of the country (Fig. 3). Total population unknown, but common in some areas, such as northern Sofala, southern Zambezia, parts of Tete and Niassa Provinces, and the eastern Rovuma Valley and northeastern coastal districts of Cabo Delgado. Elsewhere generally reduced to relic populations, many of which are endangered.

Status: Not threatened.

Conservation Measures Taken: Common in Gorongosa National Park (population estimated to be 1–2000 in 1977), but numbers may be declining because of degradation of its floodplain habitat by overgrazing and competition with hippopotamus and waterbuck. This reedbuck's major stronghold in Mozambique is in the Zambezi Valley Wildlife Utilization Unit, where the population was 4–5000 in 1977 and is probably increasing due to increased availability of suitable grassland habitat caused by the drying of some swamps. It is unlikely to be affected seriously by poaching in the Unit, particularly in the grasslands of the interior. Also occurs in Zinave National Park (250–350 in 1974, but numbers probably much reduced since then), and Niassa (rare), Gile (endangered relic population), and Maputo (declined from >300 in 1977 to 100–150 in 1982, and may now be endangered) Game Reserves. Has apparently been exterminated in Banhine National Park during the last decade, and on the verge of extinction in the Limpopo Valley Wildlife Utilization Unit.

Mountain Reedbuck (*Redunca fulvorufula*)

Distribution & Population: Restricted to the Lebombo Mountains in western Maputo Province (Fig. 3), where it has been reduced to two small relic populations.

Status: Endangered. Does not occur in any proclaimed conservation area.

Roan (*Hippotragus equinus*)

Distribution & Population: Until very recently occurred locally in parts of northeastern Gaza, northwestern Inhambane, southern Manica, and Tete Provinces. Now believed to be extinct in southern Mozambique, and reduced to two small, endangered relic populations in western Tete Province (Fig. 3).

Status: Roan was classified as threatened with extinction in Mozambique in the mid-1970s (Bothma 1975; Smithers & Tello 1976). Over the last decade, its numbers have been reduced further by uncontrolled hunting to the point where it is on the verge of extinction if not already extinct.

Conservation Measures Taken: Very small populations (20–25 animals) occurred in Banhine and Zinave National Parks in the mid-1970s, but roan no longer occur in any conservation areas.

Sable (*Hippotragus niger*)

Distribution & Population: Formerly widespread, but now eliminated from large parts of its range, e.g., in southern Mozambique. Still occurs widely at low densities in the central and northern regions of the country (Fig. 3). Total numbers probably do not exceed a few thousand.

Status: Vulnerable. Very susceptible to hunting with firearms (particularly the territorial breeding bulls) and a preferred target of hunters in many areas. Numbers are decreasing almost throughout.

Conservation Measures Taken: Occurs in Gorongosa National Park, where numbers have been reduced to about 250–300 by poaching and habitat degradation by shifting farmers, Zinave National Park, where it has been reduced to a small relic population, Niassa Game Reserve, where the population was estimated to be 1–2000 in 1977 but has probably declined since, and Gile Game Reserve (declining relic population). A major surviving population is in the Zambezi Valley Wildlife Utilization Unit, which contains excellent sable habitat. Effective anti-poaching patrols in the Unit allowed the sable population to increase spectacularly between 1972 and 1978, when numbers reached 1000–1250. Since 1982, guerilla activity within the Zambezi Valley Unit has caused a decline in anti-poaching activities and many sable have been poached. Numbers may now be about 800–1000 and are likely to decline markedly in the near future if effective control of poaching cannot be re-established.

Blue Wildebeest (*Connochaetes taurinus*)

Distribution & Population: Extinct in large parts of its former range in Mozambique, and now occurs in scattered localities in the southern, central and northern regions (Fig. 3). A high proportion of the surviving animals occur in and around Gorongosa National Park. Elsewhere, the species is reduced to small, decreasing, remnant populations.

Status: Vulnerable. Effective protection and management of Gorongosa National Park is vital for the wildebeest's long-term survival in Mozambique. The Zambezi River is the approximate southern limit of the subspecies *C. t. johnstoni,* which was listed as threatened in Mozambique by Bothma (1975). The species is now endangered in that part of the country north of the Zambezi, with a small, declining population of no more than a few hundred. The facial marking characteristic of *C. t. johnstoni* also occurs in some wildebeest south of the Zambezi (supposedly *C. t. taurinus*), in the Save Valley, but not in the main population in Gorongosa (Smithers & Tello 1976).

Conservation Measures Taken: The wildebeest population of Gorongosa National Park increased from 10–12 000 in 1978 to 12 500–16 000 in 1980. The current situation in this park is not known, but since 1980 wildebeest numbers have probably been reduced considerably in the eastern sector of the park and in the northern area outside the park. Small populations occur in some other conservation areas, viz., Banhine National Park (about 100 and declining), Zinave National Park (about 100 in 1979 and being shot for the rations of soldiers quartered in the Zinave Camp), Niassa Game Reserve (160–260 in 1977; present situation unknown), and Gile Game Reserve (on the verge of extinction).

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Population: This species has been eliminated from large parts of its former range in Mozambique, e.g., it was formerly very common in the southern region between the Save and Limpopo Rivers, and until recently occurred in northeastern Inhambane and southern Sofala, but it is now extinct south of the Buzi River. It still occurs locally in the central and northern regions (Fig. 3). The total population is no more than a few thousand, mostly in the conservation areas of northern Sofala Province. Small remnant populations occur in Niassa, Cabo Delgado (endangered), Zambezia (endangered), and Manica.

Status: Vulnerable. Lichtenstein's hartebeest lacks resilience to heavy hunting pressure and can disappear quickly from an area.

Conservation Measures Taken: The major remaining populations in Mozambique are in Gorongosa National Park (about

1500 in 1980) where it has been reduced considerably by poaching, and the Zambezi Valley Wildlife Utilization Unit where the population increased from about 780 in 1978 to 1200 in 1982. Since April 1982, the southern and western areas of the Unit have been uncontrolled because of guerilla activity, and the hartebeest population has probably been reduced by poaching to <750. This population will be reduced severely if the uncontrolled situation persists for a long time, but the hartebeest is likely to commence recovery of its numbers as soon as the area is again under a good wildlife management programme. Small populations of hartebeest occur in Niassa (about 450 in 1977; numbers may have declined since) and Gile (probably endangered) Game Reserves.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution, Population & Status: Formerly abundant in some places, e.g., the Banhine National Park area, within its range from the Zambezi River to the extreme southwestern region of the country. A few persisted in southeastern Sofala Province until about 1970, and vagrants occurred in western Gaza Province from Kruger National Park across the South African border until the Kruger Park game fence was erected (Fig. 3). The species is now considered to be extinct in Mozambique.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Occurs widely in suitable habitat of rocky hills and outcrops in the central and northern provinces, and in the Lebombo Mountains in western Maputo and Gaza Provinces (Fig. 3). Numbers unknown, but not uncommon in some areas, although now endangered in the Lebombo Mountains.

Status: Not threatened overall.

Conservation Measures Taken: Occurs in Gorongosa National Park (rare), Niassa Game Reserve (common), and Gile Game Reserve (rare).

Oribi (*Ourebia ourebi*)

Distribution & Population: Widespread in the central regions, from northern Inhambane and the Save Valley to northern Manica and Sofala, southern Tete and southwestern Zambezia (Fig. 3). Total population unknown, but locally common to abundant in some areas.

Status: Not threatened.

Conservation Measures Taken: Abundant on the floodplains of the Rift Valley floor in Gorongosa National Park (population 15–17 000 in 1980) and in open tree savannas and dambos in the Zambezi Valley Wildlife Utilization Unit. Also occurs in Banhine and Zinave National Parks, where it was formerly common (present situation unclear).

Steenbok (*Raphicerus campestris*)

Distribution & Population: Occurs widely from the Save Valley southwards, with a few small, isolated populations between the Save and Zambezi Rivers (Fig. 3). Numbers unknown, but locally common in much of Gaza and Inhambane Provinces. Rare in Maputo Province.

Status: Not threatened.

Conservation Measures Taken: Steenbok are abundant in Banhine and Zinave National Parks, common in the Limpopo Valley Wildlife Utilization Unit, and endangered in Maputo Game Reserve.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Occurs in the Lebombo range and adjacent savannas in western Maputo Province, in western and northern Gaza, western Inhambane, southwestern and northwestern Sofala. Widespread in Manica and southern Tete, and also occurs in parts of the northeastern region (Fig. 3). Numbers unknown, but locally common.

Status: Not threatened.

Conservation Measures Taken: Occurs in Gorongosa (common in the north; rare or absent elsewhere), Zinave (rare in the eastern sector; common elsewhere), and Banhine (rare) National Parks, and the Limpopo Valley Wildlife Utilization Unit.

Suni (*Neotragus moschatus*)

Distribution & Population: Widely distributed in suitable habitat of tropical forest fringes, dry and mesic forest, and scrub thickets (Fig. 3). Numbers unknown, but common within forests and coastal thickets in Gaza, Inhambane, Nampula, and Cabo Delgado Provinces.

Status: Not threatened.

Conservation Measures Taken: Rare in lowland forests and thickets of the Rift Valley but locally abundant in some riverine forests within Gorongosa National Park. Widespread and common in Zinave National Park. Occurs rarely in secondary thickets in Banhine National Park. Also occurs in Maputo Game Reserve (common), and the Wildlife Utilization Units in the Limpopo Valley (rare) and Zambezi Valley.

Impala (*Aepyceros melampus*)

Distribution & Population: This species' range in Mozambique has contracted considerably. It is still relatively numerous in parts of its present distribution (Fig. 3), e.g., on cattle ranches in southwestern Maputo Province, the central Lebombo Mountains, northwestern Gaza Province, southern and northwestern Sofala Province, and the Lugenda Valley in the north. The total population probably exceeds 50 000.

Status: Not threatened overall, but many populations are declining because of uncontrolled hunting.

Conservation Measures Taken: Abundant in Gorongosa National Park (population estimated to be 25–35 000 in 1980). Also occurs in Zinave National Park (common but decreasing), Banhine National Park (probably reduced to low numbers), Niassa Game Reserve (endangered), and the Wildlife Utilization Units in the Zambezi Valley (about 250 in 1982) and Limpopo Valley (common but decreasing). Introduced to Maputo Game Reserve but wiped out by poachers (Smithers & Tello 1976).

References

Bothma, J. du P. 1975. Conservation status of the larger mammals of southern Africa. *Biological Conservation 7:* 87–95.

Smithers, R.H.N.; Tello, J.L.P.L. 1976. Check list and atlas of the mammals of Mocambique. *Memoir National Museums & Monuments of Rhodesia No. 8.* 184 pp.

Tello, J.L.P.L. 1986. Survey of protected areas and wildlife species in Mozambique with recommendations for strengthening their conservation. Report to WWF, Gland.

Tinley, K.L.; Rosinha, A.J.; Tello, J.L.P.L.; Dutton, T.P. 1976. Wildlife and wild places in Mozambique. *Oryx 13:* 344–350.

Chapter 7: Namibia

P.T. van der Walt

Introduction

Most of Namibia is covered by a section of the great southern African plateau (altitude 1000–2000 m), including part of the Kalahari basin. On the western edge of the plateau, the escarpment zone forms a mountainous transition belt to the coastal Namib desert. The inland plateau is largely a featureless plain, with scattered areas of broken terrain, ridges, and hills. The coastal desert is about 80 km wide, and comprises mainly gravel plains in its northern half and sand dunes in the southern half.

The climate of Namibia is arid to semi-arid. Mean annual rainfall varies from <50 mm on the coast to about 600 mm in the extreme northeast. Giess (1971) recognised three major biomes, viz., desert, savanna, and woodland (Fig. 1). The sparsely vegetated desert biome includes the coastal Namib, of which the southern portion (desert and succulent steppe) receives winter rainfall, and the Etosha Pan with its fringe of halophytic vegetation.

Giess distinguished eight zones within the savanna region, including mopane (dominated by *Colophospermum mopane,* varying from dense woodland to shrubland with scattered trees), mountainous savanna and Karstveld (characterised by the trees *Kirkia acuminata* on dolomite ridges and *Peltophorum africanum* on the more sandy plains), the escarpment zone (semi-desert and savanna transition with a mean annual rainfall of 100 mm or less), thornbush savanna (grassland with trees and shrubs in dense or open clumps), highland savanna (covering the mountainous area of the Khomas Hochland, with *Acacia hereroensis, Combretum apiculatum* and *Ozoroa crassinervis* the most characteristic trees), dwarf shrub savanna (*Rhigozum trichotomum* and other Karroid shrubs covering the arid plains of the southern part of the country, where mean annual rainfall is 100–200 mm), camelthorn savanna (central Kalahari open savanna with *Acacia erioloba* the dominant tree species), and mixed tree and shrub savanna (southern Kalahari vegetation in the southeast of the country, with *Acacia haemotoxylon* in tree and shrub forms the most typical plant).

The northeast of the country, with its relatively high rainfall (average 450–600 mm per annum), supports woodland dominated by *Pterocarpus angolensis* and *Baikeaea plurijuga,* with patches of *Acacia albida/A. erioloba* riverine woodland along the larger rivers. The northeastward extension of the country formed by the Caprivi Strip includes several marshy areas on the Kwando, Linyanti and other rivers.

Population density is low (1.25 persons per sq km), with 57% of the population concentrated in 8% of the country in the northern regions, reflecting the availability of water. Stock farming is the dominant agricultural activity (50% sheep, 28% cattle, 22% goats). Intensively managed, fenced farmland covers about 45% of the country, with an extensive communal system of stock farming in about 40% and most of the remainder comprising state-owned conservation areas (Fig. 2).

Large-scale development of the intensive livestock farming industry with its associated construction of fences and waterpoints commenced in the 1920s. Initially, this had a generally adverse effect on wildlife, because of competition with livestock for food and water, increased hunting pressures, and restriction of game movements. In addition to fences on farmland, during the 1960s a network of gameproof fences was erected along the entire eastern border (6600 km) and from east to west in the northern sector, for the control of livestock diseases. Other factors which have had a major influence on wildlife populations include widespread overgrazing of farmland in the early–mid-1960s, resulting in bush encroachment which favoured greater kudu and other browsers, and a serious outbreak of rabies from 1978 to 1983, which caused heavy losses among some wildlife species (an estimated 80 000 kudu died within a 3-year period).

Despite some adverse effects of agricultural development on wildlife, Namibia's low human population density has allowed extensive areas of natural habitat to remain relatively unaffected, and the country's large mammal populations are generally still in a healthy state. Conservation areas cover 12.1% of the country (Fig. 2) and the well-established conservation authority is assisted by a sound core of public support. Equally important is the positive attitude towards game which has been adopted widely amongst farmers since 1968, when they received by ordinance ownership of certain species of game on their farms. This has led to a booming farm-based wildlife utilisation industry. The commoner antelope species such as kudu, eland, gemsbok, red hartebeest, steenbok and springbok still occupy a large part of their natural ranges in Namibia, with 80 to >95% of the total numbers of each species occurring on privately owned farmland. The distributions of some antelope species have been extended considerably by the establishment of populations in farming districts outside the species' natural ranges.

Current Status of Antelopes

The antelopes of Namibia can be divided into two groups, viz., widespread species characteristic of the desert and/or savanna biomes, and species which have restricted distributions, mainly in the extreme northeast. The characteristic species of the desert biome are gemsbok and springbok, which still occur widely in substantial populations in the Namib. Some other species, e.g., kudu, grey duiker and steenbok, enter the coastal desert marginally along dry watercourses with a sparse vegetation of bushes and shrubs. Gemsbok and springbok also occur widely in the savanna biome, where other characteristic species include kudu, grey duiker, red hartebeest and steenbok, with dikdik in the northwestern and central savannas, blue wildebeest (formerly) and eland widespread in the less arid northern and eastern savannas, and klipspringer on suitable broken terrain in the escarpment zone and central regions. Most of these ten species are still relatively widespread and their current status is satisfactory (Table 1). Kudu, eland, grey duiker, gemsbok, blue wildebeest and steenbok occur widely in the northeastern woodlands as well as in the savannas.

The second group includes ten species, most of which have been recorded within the country only in the relatively moist habitats of the extreme northeast. An exception is the black-faced race of the impala which is restricted to part of the northwestern mopane savanna. This group comprises those species whose status is listed as endangered, rare or vulnerable in Table 1. In most cases, the relatively small or very small areas of available habitat for these ten species within the country account for their current status. Some of these antelopes, e.g., puku, may only occur within Namibia as vagrants which enter the Caprivi Strip from Botswana.

In the early 1960s, Namibia took the lead in southern Africa

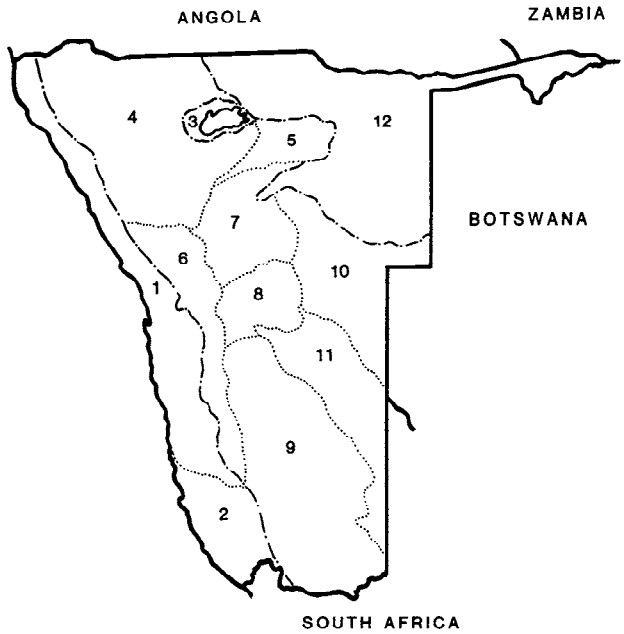

Fig. 1. Vegetation zones of Namibia (simplified after Giess 1971). Desert biome—1: Namib. 2: Desert and succulent steppe. 3: Saline desert with dwarf savanna fringe. Savanna biome—4: Mopane savanna. 5: Mountainous savanna and Karstveld. 6: Escarpment zone. 7: Thornbush savanna (tree and bush savanna). 8: Highland savanna. 9: Dwarf shrub savanna. 10: Camelthorn savanna. 11: Mixed tree and shrub savanna. Woodland biome—12: Forest savanna and woodland.

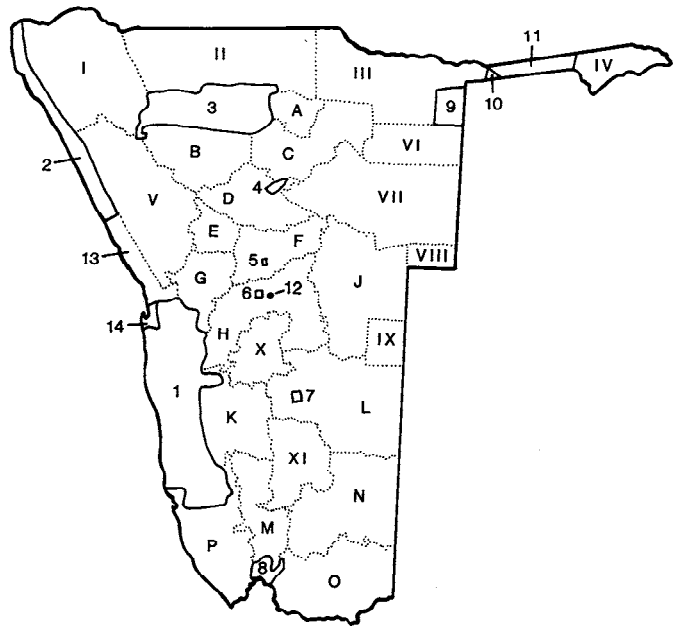

Fig. 2. Major land-use categories of Namibia. Intensive farming districts—A: Tsumeb. B: Outjo. C: Grootfontein. D: Otjiwarongo. E: Omaruru. F: Okahandja. G: Karibib. H: Windhoek. J: Gobabis. K: Maltohöhe. L: Mariental. M: Bethanien. N: Keetmanshoop. O: Karasburg. P: Lüderitz (largely comprises Diamond Areas). Communal areas—I: Kaokoland. II: Ovamboland. III: Kavango. IV: Eastern Caprivi. V: Damaraland. VI: Bushmanland. VII: Hereroland. VIII: Rietfontein. IX: Aminuis. X: Rehoboth. XI: Namaland. Conservation areas—1: Namib-Naukluft Park (49 768 sq km). 2: Skeleton Coast Park (16 390 sq km). 3: Etosha National Park (22 270 sq km). 4: Waterberg Plateau Park (405 sq km). 5: Von Bach Recreational Resort (43 sq km). 6: Daan Viljoen Game Park (40 sq km). 7: Hardap Game Reserve (250 sq km). 8: Fish River Canyon Nature Reserve (461 sq km). 9: Khaudom Game Park (3841 sq km). 10: Mahango Game Park (244 sq km). 11: Western Caprivi Game Reserve (1750 sq km). Other areas—12: Windhoek. 13: Swakopmund (National West Coast Tourist Area). 14: Walvis Bay (Republic of South Africa).

in developing the wildlife utilisation industry in commercial farming areas. This industry has a major influence on the current satisfactory conservation status of the commoner, more widespread antelopes which are the country's most typical antelope species (Table 1). Wildlife populations on private farms benefitted substantially from the introduction of measures such as the livestock reduction scheme, aimed at improving range management and soil conservation. This led farmers to appreciate the economic benefits of wildlife. Since 1959 a sophisticated multiple-use system of game utilisation has been developed, involving both the national conservation authority and farmers. This system harmonises the concepts of the aesthetic and economic value of game. Its major components are:

Tourism on State Land: The Directorate of Nature Conservation and Recreation Resorts operates a diverse tourist industry (income R7.1 million in 1985) within the state-owned conservation areas. This includes hutted camps and wilderness trails, and is geared towards exposing visitors to nature rather than mass tourism.

Non-hunting Safaris: Some private farms specialise in camera safaris (income R0.5 million in 1985).

Night-harvest of Game: Since 1975, when legislation was altered to accommodate the private sector in night-harvesting operations, this aspect has become a very important facet of the game industry (income R0.9 million in 1985). Springbok is the predominant species harvested. The carcasses are both marketed locally and exported.

Trophy Hunting: Legislation allowing game to be hunted for its trophy value was adopted in 1967. Since then, trophy hunting (predominantly kudu, gemsbok and springbok) has become the most lucrative option for wildlife utilisation on farms. Trophy hunters from many countries visit Namibia each year, and the income from trophy hunting was about R2.0 million in 1985.

Sport Hunting: Hunting permits were abolished in 1969 when landowners received full ownership of all huntable game, other than specially protected and protected species. It is difficult to monitor the number of animals shot by meat hunters and by farmers for their own use, but a calculation based on the trade in hides in 1980 showed a value of R2.3 million of game utilised in this way.

Game Capture: The policy of the Directorate of Nature Conservation and Recreation Resorts to distribute surplus game animals from conservation areas to local farmers at subsidised prices has been a significant factor in the successful establishment of game species on farms where they previously occurred. Over the last decade, the Directorate's game capture operations have been

Table 1
Current Status of Antelopes in Namibia

Species	Status*	Species	Status
Bushbuck	En	Sable	R
Sitatunga	En	Gemsbok	S
Greater Kudu	S	Blue Wildebeest	S
Common Eland	S	Red Hartebeest	S
Grey Duiker	S	Tsessebe	V
Waterbuck	En	Klipspringer	S
Red Lechwe	V	Damaraland Dikdik	S
Puku	En	Steenbok	S
Southern Reedbuck	V	Impala	R
Roan	R	Springbok	S

* En = endangered; R = rare; V = vulnerable; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

directed mainly at translocating the country's scarcer and endangered species to conservation areas, and removing large numbers of common (*Equus burchelli*) and mountain (*E. zebra hartmannae*) zebras out of Etosha National Park. The expanding demand for game animals among farmers now exceeds the available supply.

The value of game dealing was R1.8 million in 1985. Registered private game dealers deal in live game, mainly for the export market, and a substantial trade in live game animals has developed between Namibia and the Republic of South Africa. Farmers in South Africa are particularly keen to obtain gemsbok, springbok and red hartebeest. In exchange, local farmers often receive game species which do not occur naturally in Namibia. This has resulted in the establishment of three exotic antelope species from South Africa, viz., nyala, black wildebeest and blesbok. The importation of alien species and subspecies of game is a matter of some concern which requires careful control, e.g., to avoid contamination of gene pools.

Conservation Measures Taken

Proclaimed conservation areas (Fig. 2) protect substantial parts of all three major biomes (Fig. 1) and form the basis of the country's expanding tourist industry. Efficient law enforcement is a vital element of the protection of these areas. Almost all of the antelope populations of the country's conservation areas are currently stable or increasing.

The large conservation areas reflect the systems approach adopted as the national conservation strategy, with the emphasis on maintaining the greatest possible natural species diversity. The Namib-Naukluft Park, for example, has been enlarged progressively to a size of >49 000 sq km, making it the largest park on the African continent. This park extends from the coast to the escarpment, and includes coastal lagoons, gravel plains and canyons north of the Kuiseb River, sand dunes south of the Kuiseb, and the Naukluft massif (970 sq km of cliffs, canyons, plateaux, and bushy valleys) which towers over the surrounding desert and plains. The Namib-Naukluft Park supports major populations of coastal desert and escarpment wildlife, such as thousands of gemsbok and springbok on the desert plains, numerous klipspringer on the steeper slopes of the Naukluft and the Kuiseb River canyon, smaller numbers of kudu in areas of thornbush, and the largest surviving concentration of Hartmann's mountain zebra. The Skeleton Coast Park, which includes the gravel plains and coastal dunes of the northern Namib, also contains significant numbers of gemsbok and springbok.

Etosha National Park protects a very large area of mopane savanna, bushland and grass-covered plains around the vast, saline, seasonally inundated Etosha Pan. It protects a major savanna antelope community, including all ten species characteristic of the savanna biome plus the rare black-faced impala. Lower numbers of savanna antelope species (largely reintroduced) occur in the much smaller Daan Viljoen Game Park (the major protected area of highland savanna), Hardap Game Reserve, and the Von Bach Recreation Resort.

Waterberg Plateau Park includes the savanna-covered plateau, the steep cliffs which surround the plateau on its eastern and western sides, and denser woodland on the plains below. This park contains a diverse antelope community, including a naturally occurring eland population. Preservation of rarer ungulate species such as roan, sable and buffalo (*Syncerus caffer*) is given priority in this area. Western Caprivi Game Reserve and the newly established Mahango and Khaudom Game Parks protect populations of most of the rarer antelope species of the far northeast of the country.

Conservation Measures Proposed

Maintenance, and where appropriate, further extensions of the existing system of conservation areas will provide the main approach to long-term preservation of the country's antelopes. This will be especially important for the rarer species which do not occur naturally on private farmland. The realisation that wildlife forms one of the country's greatest economic assets augurs well for the future of antelopes in farming areas. The important role of farmers as conservation agents and the goodwill that has been developed between the conservation authority and the farming community must be expanded further. This will require measures such as ongoing wildlife monitoring and research, sensible legislation, coordination and continued communication between all interested parties. All disciplines involved are represented by societies which are affiliated to the National Game Committee.

The IUCN goals of nature conservation, viz., to ensure that the biosphere can continue to renew itself and provide for all means of life, to ensure human survival and well-being, and to keep future development options open, will be reached most effectively in Namibia by adopting a sensible approach to the utilisation of all the country's natural resources.

Species Accounts

In the following accounts of individual species, populations in conservation areas and communal areas are based on the latest available counts from aerial and/or ground surveys conducted between 1982 and 1986. Populations in intensive farming areas are based on a 1982 questionnaire survey (Joubert et al. 1983); for some species, comparisons are made with a similar survey in 1972 (Joubert & Mostert 1975).

Bushbuck (*Tragelaphus scriptus*)

Distribution, Population & Status: This species has been recorded in the far northeast (Fig. 3), but little is known about its occurrence in Namibia, where it is seldom seen. Individuals may occasionally cross into the Caprivi Strip from adjacent Botswana, where it is locally common, e.g., in the woodlands along the Chobe River. It must be classed as endangered because of its marginal occurrence within the country.

Sitatunga (*Tragelaphus spekii*)

Distribution & Population: This species is restricted to a few areas of suitable swampy habitat on the Okavango, Kwando, Linyanti, Chobe and Zambezi Rivers in the Caprivi Strip (Fig. 3). The total population may not exceed 20–40 animals, and is an outlier of the larger populations in Botswana's Okavango and Linyanti swamps.

Status: Endangered, in view of its very small population.

Conservation Measures Taken: Occurs in Western Caprivi Game Reserve, where 6 individuals are known to be present, and in Mahango Game Park, where 14 individuals have been observed. Effective protection of these two conservation areas may now allow these small populations to increase, but this species' numbers in Namibia will always be low because of the very restricted area of suitable habitat.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: One of the country's most characteristic antelopes, the kudu remains widespread and very common. It occurs in suitable habitat throughout, and is completely absent from only the most arid areas (coastal Namib and parts of the south; Fig. 3). Kudu numbers have fluctuated considerably over the last 15 years. The population in farming districts (which represents >95% of total numbers) was estimated to be 110 000

in 1972. It probably increased to about 200 000 in the mid-1970s, as a result of above average rainfall in the early to mid-1970s, bush encroachment on to farmland, and an increasingly favourable attitude among landowners towards game (Joubert et al. 1983). This marked increase was followed by a dramatic collapse caused by a severe outbreak of rabies (Hassel 1982). The kudu population of the central and northern districts, which was probably well above the ecological carrying capacity before the rabies outbreak, may have been reduced by up to 75% (Joubert et al. 1983). By 1982 total numbers in farming districts had declined to about 96 000, with the greatest numbers in Grootfontein (18 800), Gobabis (15 000), Okahandja (12 800), Outjo (12 600) and Otjiwarongo (10 800). The species also occurs in low to moderate numbers in all of the communal areas (total numbers about 1350, including 875 in Bushmanland), and in all conservation areas (total numbers about 1800).

Status: Satisfactory (not threatened).

Conservation Measures Taken: The largest protected population on state-owned land is in Etosha National Park (about 1000 and increasing). Smaller stable or increasing populations occur in the Namib-Naukluft Park (about 160), Hardap Game Reserve (about 80), Von Bach Resort (40), Waterberg Plateau Park (about 150), Fish River Canyon (10), Western Caprivi Game Reserve (about 70), and Daan Viljoen (about 30), Mahango (17) and Khaudom (about 220) Game Parks. Kudu occur rarely in Skeleton Coast Park.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Formerly occurred throughout the woodland biome and in adjacent savanna in the north and east (Fig. 3); still occurs widely. Eland have now been introduced to all of the country's farming districts, although numbers are low to very low in southern and central districts. It is one of the most sought after game species by farmers, and total numbers on farmland are increasing steadily. There were an estimated 7800 on farmland in 1972. The total population is currently about 13–14 000, including 11 800 on private farms (>7000 of these in the Grootfontein district), about 1000 in communal areas (almost all in Hereroland), and the remainder in conservation areas.

Status: Satisfactory.

Conservation Measures Taken: Well represented by increasing populations in Etosha National Park (350) and Waterberg Plateau Park (280). There is a population of about 50 in Daan Viljoen Game Park, with small (<20) but increasing populations in Von Bach Resort and Khaudom Game Park. Also occurs in Western Caprivi Game Reserve (rare).

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Occurs wherever there is sufficient cover (Fig. 3). It is largely absent from the Namib desert. The grey duiker is widespread in all farming districts and is one of the commonest antelopes on farmland, with the largest numbers in the Gobabis and Mariental districts (estimated population >10 000 in each of these districts). Smaller numbers occur in communal areas and conservation areas. The total population is about 50–55 000. Numbers may have declined slightly over the last decade because of drought.

Status: Satisfactory.

Conservation Measures Taken: Occurs in low to moderate numbers in all of the conservation areas shown in Fig. 2, except Skeleton Coast Park. Rare in Hardap Game Reserve, Namib-Naukluft Park and Fish River Canyon.

Waterbuck (*Kobus ellipsiprymnus*)

Distribution, Population & Status: The subspecies *K. e. ellipsiprymnus* has been recorded from the eastern Caprivi Strip (Fig. 3). The very restricted area of suitable habitat (grassland near permanent water) within Namibia limits this species to marginal natural occurrence and endangered status. A population of 160 waterbuck has been established on private farmland through the importation of animals from South Africa by two game ranching operations in the Otjiwarongo district.

Red Lechwe (*Kobus leche leche*)

Distribution & Population: Occurs on the floodplains of the Okavango, Kwando, Linyanti, Mashi, Chobe and Zambezi Rivers in the Caprivi Strip (Fig. 3). Common in Eastern Caprivi (population about 4300), with an additional 150–200 within the conservation areas in the western Caprivi.

Status: Vulnerable, in view of its very restricted distribution and the small numbers within protected areas.

Conservation Measures Taken: There is a population of about 120 in Western Caprivi Game Reserve, and a smaller but increasing population (about 50) in Mahango Game Park. Maintenance of viable populations within these two conservation areas is the best prospect for ensuring this species' long-term survival within the country.

Puku (*Kobus vardoni*)

Distribution, Population & Status: The occurrence of this species in Namibia is highly marginal (Fig. 3), and its status is very precarious. It was formerly numerous in adjacent north-eastern Botswana on the grassy flats on the south bank of the Chobe River, where a small population survives within Chobe National Park. Smithers (1983, p. 695) states "At one time they occurred on the north bank of the Chobe River in the Caprivi Strip but by 1969 had disappeared." The most recent census of Eastern Caprivi revealed four puku within Namibia. These were presumably vagrants from the small Botswana population.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Occurs marginally in the northeast, formerly as far west as Ruacana Falls on the Cunene River in northwestern Ovamboland (Fig. 3). It is still present in small numbers in the Caprivi Strip, Kavango and Bushmanland. The total population may not exceed about 50 animals.

Status: Vulnerable.

Conservation Measures Taken: Small but increasing populations occur in Mahango (23) and Khaudom (10) Game Parks. It is present in very small numbers (<10) in Western Caprivi Game Reserve. Establishment of viable populations in these northeastern conservation areas should ensure this species' survival in Namibia.

Roan (*Hippotragus equinus*)

Distribution & Population: Formerly occurred widely in the northeastern woodlands (Fig. 3). It still occurs locally in conservation areas and communal areas within its former range. Small numbers have been introduced to farmland in the Okahandja, Windhoek and Gobabis districts. The total population is about 570, including 390 in conservation areas, 120 in communal areas (>100 of these in Bushmanland), and 60 on private farms.

Status: Rare. The population within conservation areas is increasing steadily.

Conservation Measures Taken: Now well represented by substantial, increasing populations in Khaudom Game Park (about 160) and Waterberg Plateau Park (220). The Waterberg animals originated from the Kavango district, and were held in quarantine in Etosha National Park's Otjovasandu fenced camp for several years before transfer to the Waterberg park. Very small numbers of roan (<10) occur in Western Caprivi Game Reserve and Mahango Game Park.

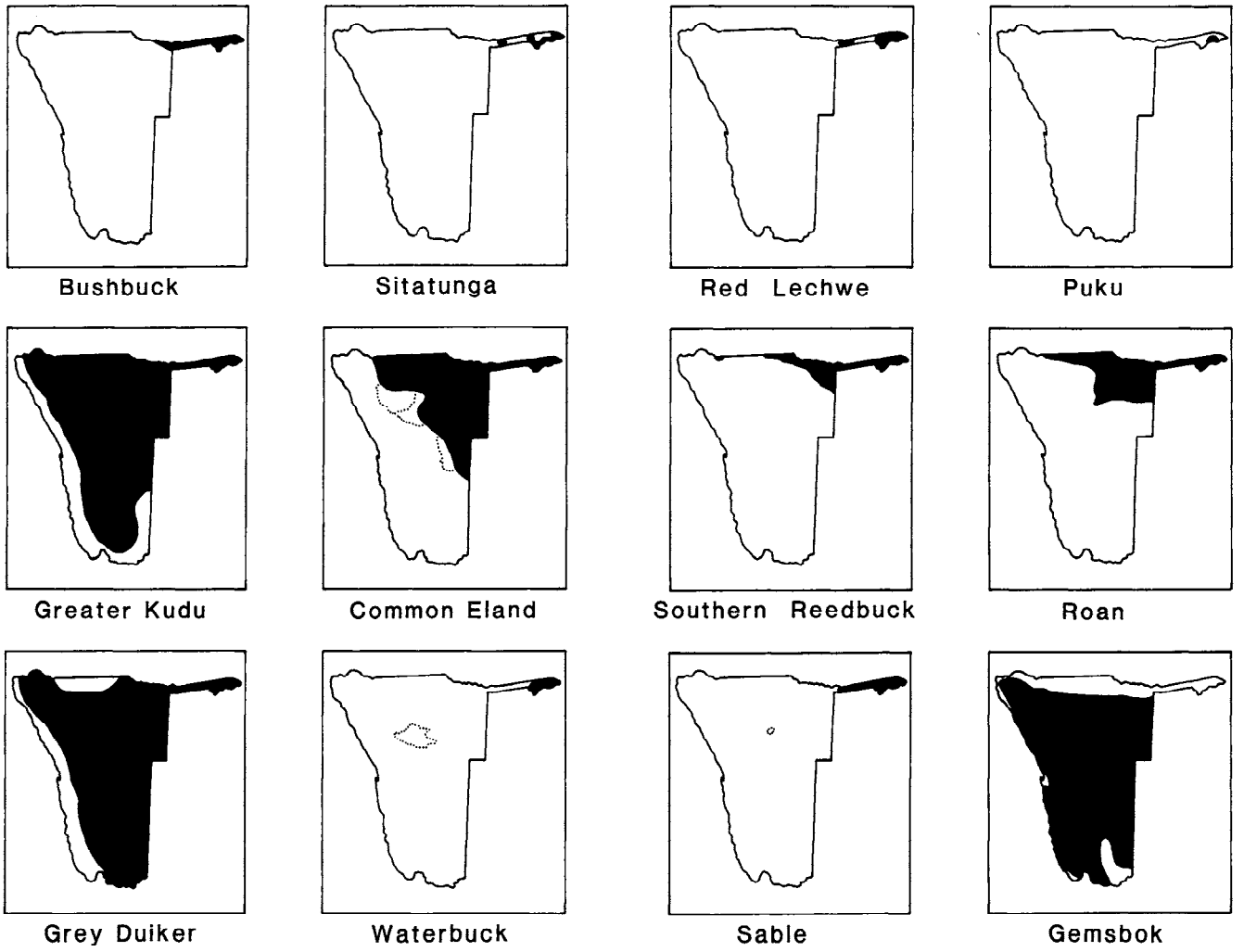

Fig. 3. Distribution of antelopes in Namibia. Shaded areas represent the approximate limits of each species' natural range (not the area of continuous occurrence), based on Shortridge (1934) and Smithers (1983). Where indicated, dotted lines represent farming districts and conservation areas where substantial populations now occur outside the species' natural range.

Sable (*Hippotragus niger*)

Distribution & Population: Occurs naturally in the Caprivi Strip, and has been introduced to the Waterberg Plateau (Fig. 3). The population is about 300, with about 260 in conservation areas and 40 in Eastern Caprivi.

Status: Rare. Numbers are increasing satisfactorily within conservation areas.

Conservation Measures Taken: There is a stable population of 125 in Western Caprivi Game Reserve. This species also occurs in Mahango Game Park (population 73 and increasing), and Waterberg Plateau Park (population 60 and increasing). The Waterberg population originated from sable captured in the Caprivi Strip.

Gemsbok (*Oryx gazella gazella*)

Distribution & Population: Widespread, but absent from some coastal parts of the Namib and some areas in the north and south of the country (Fig. 3). The total population is about 80 000, including about 64 000 on private farmland, about 1000 in communal areas, and about 15 000 in state-owned conservation areas. It occurs in all farming districts, where the species has shown a marked increase (the population on farmland in 1972 was estimated to be about 40 000). This increase has been achieved despite recent droughts, reflecting the gemsbok's ability to tolerate arid conditions. In 1982, the greatest numbers on farms occurred in the Okahandja (about 14 000), Otjiwarongo (9500), Windhoek (9000), and Gobabis (8800) districts. Numbers are declining in communal areas, but populations of 160–400 occur in Kaokoland, Bushmanland and Hereroland, with 800–1200 in Damaraland. Very small numbers are still present in all of the other communal areas, except Ovamboland and Eastern Caprivi.

Status: Satisfactory. Very common in farming districts and one of the two most numerous antelope species in conservation areas.

Conservation Measures Taken: The recent extension of the Namib-Naukluft Park is of major importance for the conservation of gemsbok. This park now has an estimated population of about 10 300. Large numbers of gemsbok also occur in Etosha National Park (about 3250) and Skeleton Coast Park (about 1400). The species is also well represented in Hardap Game Reserve (population about 450), Khaudom (about 140) and Daan Viljoen (about 50) Game Parks, Waterberg Plateau Park (about 90), and Von Bach Resort (36). It is rare in Fish River Canyon.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: Formerly occurred widely in the northeast and southwards along the eastern border (Fig. 3). Shortridge (1934) described this species as the most plentiful large open-country antelope in the territory of South West Africa. Its numbers are now greatly reduced, with a total population of about 3900. The species is a reservoir for malignant nasal catarrh, and was eradicated from much of its former range when the intensive cattle industry was developed. It is now staging a slow comeback

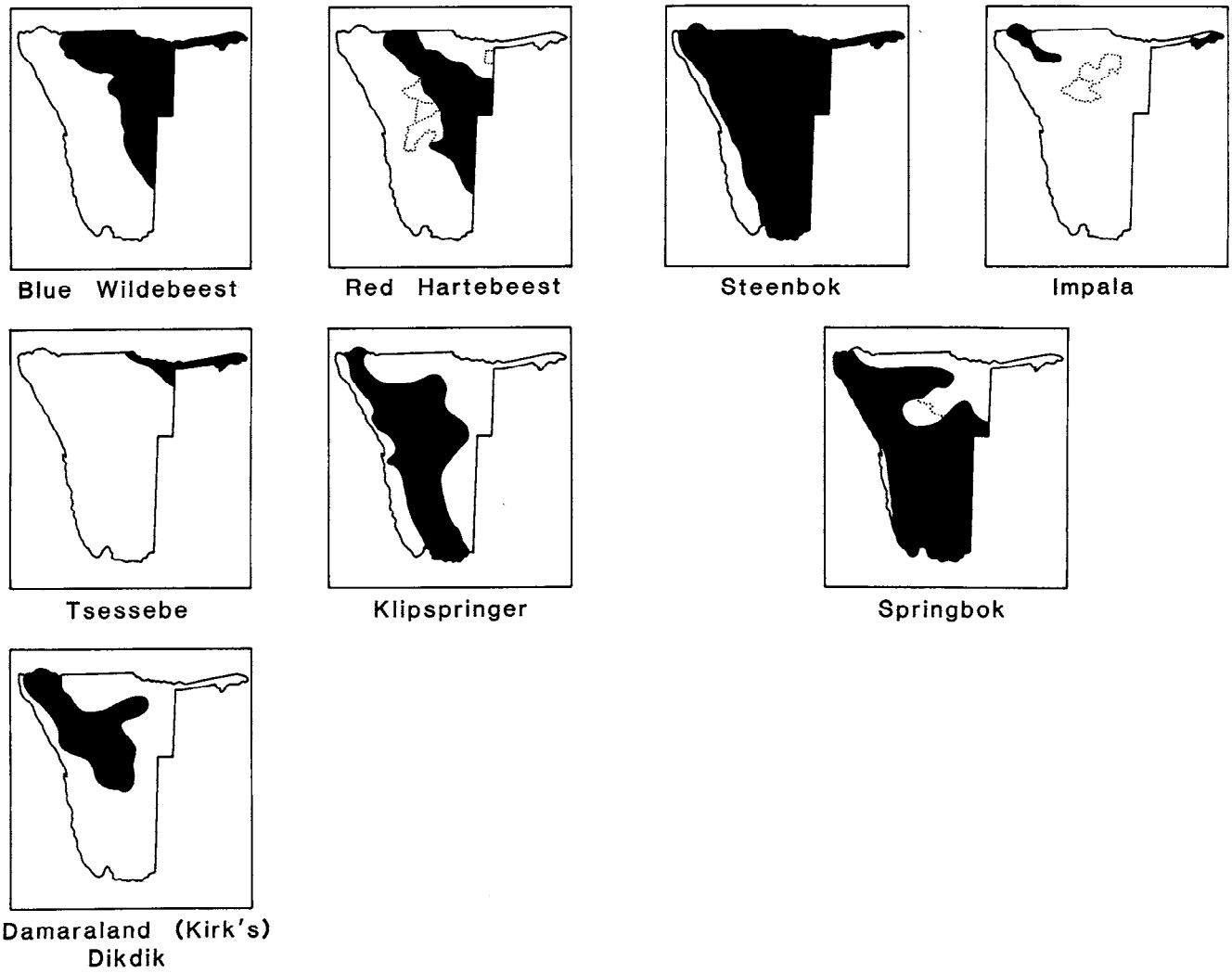

Fig. 3. Distribution of antelopes in Namibia—continued.

in farming districts, in view of its value as a trophy animal. In 1982 there were about 650 blue wildebeest on private farms, mainly in the Otjiwarongo and Gobabis districts. It still occurs at low population densities in communal areas (total numbers about 790), with the largest numbers in Kavango (300), Bushmanland (370), and Hereroland (100). The bulk of the country's population (about 2500) occurs in conservation areas.

Status: Satisfactory. Although it has been reduced to a small remnant of its former population, its survival is not threatened within Namibia.

Conservation Measures Taken: The country's major population of blue wildebeest is in Etosha National Park. A large migratory population of about 30 000 formerly migrated annually between Etosha (wet season range) and Ovamboland to the north (dry season range). The erection of game proof fences between 1960 and 1973 eliminated the migratory population, leaving a smaller, sedentary population within the national park (Berry & Siegfried 1979). Wildebeest numbers in Etosha National Park continued to decline, with anthrax a major cause of mortality (Berry 1983), but the population has stabilised at about 2250 in the last few years and is beginning to increase again. Blue wildebeest also occur in Khaudom Game Park (about 200), and in Daan Viljoen Game Park (numbers maintained at about 40).

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Population: Formerly occurred in the northern and eastern parts of the savanna biome; absent from the more arid savannas of the west and south, and from most of the north-eastern woodlands (Fig. 3). Over the last two decades there has been a constant increase in the numbers of this species on private farms and a constant expansion of its range in farming districts. It now occurs in almost all of the country's farming districts, including several districts outside its natural range. It is still present in small numbers in communal areas (Kavango, Bushmanland, Hereroland and Rietfontein; overall numbers declining), and is well represented in conservation areas (numbers increasing). The total population is >20 000, including about 19 400 on farms (largest numbers in the Gobabis (6800) and Windhoek (5500) districts), 150 in communal areas (including >100 in Bushmanland), and >600 in conservation areas.

Status: Satisfactory.

Conservation Measures Taken: The major protected population on state-owned land is in Etosha National Park (about 490). Populations have been established successfully in several other conservation areas by the translocation of captured animals. Stable populations occur in Hardap Game Reserve (about 20) and Waterberg Plateau Park (about 50), with increasing populations in Khaudom (about 20) and Daan Viljoen (about 50) Game Parks.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Confined to the extreme northeast (Fig. 3), where it occurs in small numbers. The total population is about 150–160, including about 50 animals in Kavango, 30 in Eastern Caprivi, and 75 in conservation areas.

Status: Vulnerable, in view of its low numbers and restricted distribution.

Conservation Measures Taken: There is a small, stable population of 26 tsessebe in Western Caprivi Game Reserve. The small populations in Mahango (13) and Khaudom (36) Game Parks are increasing. Maintenance of effective protection within these conservation areas should allow the country's tsessebe population to increase to satisfactory levels.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: This species occurs wherever there are extensive areas of suitable habitat (broken, rocky terrain), viz., throughout the mountainous escarpment and broken plateau regions of the country (Fig. 3). The total population exceeds 15 000, including about 14 000 on farmland (largest numbers in the Keetmanshoop (about 3100), Karasburg (about 2000), and Windhoek (about 1800) districts), with smaller numbers in communal areas and conservation areas.

Status: Satisfactory.

Conservation Measures Taken: The largest protected population on state-owned land is in the Namib-Naukluft Park, where klipspringer is common on the Naukluft massif and in the Kuiseb River canyon (total numbers in the park >1000). Smaller populations occur in Etosha National Park, Waterberg Plateau Park, and Fish River Canyon.

Damaraland (Kirk's) Dikdik (*Madoqua kirkii*)

Distribution & Population: Occurs on thicket-covered broken ground in the northwestern and central regions of the country (Fig. 3), where it is common. The total population exceeds 12 000, with >11 000 estimated to occur on farms within the species' natural range (largest numbers in the Outjo (about 4800) and Grootfontein (about 2500) districts), and smaller numbers within conservation areas and on communal lands. The recent drought has probably had an adverse effect on dikdik populations in the marginal habitats in the southern part of its range.

Status: Satisfactory.

Conservation Measures Taken: Well represented in Etosha National Park (population >800), with small populations in Waterberg Plateau Park (40) and Von Bach Resort (10).

Steenbok (*Raphicerus campestris*)

Distribution & Population: Occurs throughout in open or bush-covered level terrain, except for the Namib desert (Fig. 3). It penetrates the Namib to some extent along dry watercourses with associated thickets (Smithers 1983).The total population exceeds 100 000. It is very common in all of the country's farming districts, with an estimated population of about 101 000 on farmland (greatest numbers (about 26 000) in the Mariental district). It also occurs at low densities in all communal areas, and is well represented within conservation areas.

Status: Satisfactory.

Conservation Measures Taken: Occurs in all of the conservation areas shown in Fig. 2, except for Fish River Canyon. It is difficult to estimate this species' numbers by aerial/ground census, because of its shy nature and cryptic coloration, but it probably occurs in substantial numbers in the larger conservation areas. It is regarded as being relatively rare in the Namib-Naukluft Park, for example, although it is common locally in some parts of this park, such as along the Kuiseb River (Stuart 1975). Tilson & Henschel (1986) reported a population density of 0.2 per sq km in a 3080 sq km area around the Kuiseb River within the Namib-Naukluft Park. This suggests that the total population of steenbok in this park alone is at least several hundred individuals.

Impala (*Aepyceros melampus*)

Distribution & Population: This species formerly occurred in two separate areas, the black-faced race (*A. m. petersi*) in the northwest, and the common impala (*A. m. melampus*) in the eastern Caprivi Strip (Fig. 3). Both subspecies have been introduced to most of the country's farming districts, although generally in low numbers because relatively few farmers are willing to undergo the expense of the 2.5-m-high fencing necessary to contain impala. The black-faced impala on farmland originated from animals supplied by the Directorate of Nature Conservation and Recreation Resorts, and the common impala from the Republic of South Africa. The total population on farmland (both subspecies combined, but predominately black-faced) was about 900 in 1982 (mainly in the Otjiwarongo (435) and Grootfontein (326) districts), with smaller numbers of both subspecies in conservation areas. In communal areas, the black-faced race still occurs rarely in Kaokoland, and there is a population of about 100 common impala in Eastern Caprivi.

Status: Both subspecies are regarded as rare, because of their small populations. The black-faced race is of major conservation interest because it is confined to Namibia and a small area of adjacent southwestern Angola. Its numbers in Namibia have now reached 750–1000 and are continuing to increase.

Conservation Measures Taken: Black-faced impala occur in Etosha National Park (population about 350 and increasing). There is an introduced population of 17 common impala in Waterberg Plateau Park.

Springbok (*Antidorcas marsupialis*)

Distribution & Population: Widespread in the desert and savanna biomes (Fig. 3), where it is very common. The total population is about 130 000. This includes about 110 000 on farmland (largest numbers (28 600) in the Mariental district). The overall population on farmland has declined since 1972, when it was about 142 000, probably because of the drought of the early 1980s. This species also occurs in all of the communal areas except Ovamboland and Eastern Caprivi (overall numbers >6000, including 3000 in Aminuis). There are about 14 000 springbok in conservation areas.

Status: Satisfactory. Springbok is one of the two most numerous species on state-owned conservation land. More than any other game species, it has brought the intrinsic economic value of game home to many farmers in Namibia.

Conservation Measures Taken: Etosha National Park contains a major springbok population (about 10 700). The recent extension of the Namib-Naukluft Park has been of considerable benefit to this species, with a population of about 2600 in the enlarged park. Springbok also occurs in Skeleton Coast Park (about 490), Hardap Game Reserve (about 200) and Daan Viljoen Game Park (about 20). All of these protected populations are increasing.

Exotic Species

Populations of three antelope species introduced from the Republic of South Africa are now established on farmland in Namibia. Small numbers (total population 110) of nyala (*Tragelaphus angasii*) occur on game ranches in the Otjiwarongo and Outjo districts. Black wildebeest (*Connochaetes gnou*) is present in small numbers (total population 149) in Otjiwarongo, Okahandja, Windhoek and Mariental. Blesbok (*Damaliscus dorcas phillipsi*) is more widespread and occurs in larger numbers, reflecting its popularity with farmers because it is contained by ordinary livestock fences and reproduces successfully in small paddocks. In 1982, blesbok occurred in 13 of the country's farming districts, with a total population of about 2000 (largest numbers (630) in the Maltohöhe district).

References

Berry, H. 1983. The blue wildebeest problem at Etosha National Park. *African Wildlife 39*(5): 192–197.

Berry, H.H.; Siegfried, W.R. 1979. Stop-watch wildebeest. *African Wildlife 33*(1): 17–21.
Giess, W. 1971. A preliminary vegetation map of South West Africa. *Dinteria No. 4.*
Hassel, R.H. 1982. The incidence of rabies in kudu in South West Africa/Namibia. *South African Journal of Science 78:* 418–421.
Joubert, E.; Mostert, P.K.N. 1975. Distribution patterns and status of some mammals in South West Africa. *Madoqua 9:* 5–44.
Joubert, E.; Morsbach, D.; Wallis, V. 1983. The 1982 distribution patterns and status of some mammals on farms in South West Africa. Departmental Report N 18/2/2/1, Directorate of Nature Conservation & Recreational Resorts, Windhoek.
Shortridge, G.C. 1934. The mammals of South West Africa. Vols. 1 and 2. London, Heinemann.
Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.
Stuart, C.T. 1975. Preliminary notes on the mammals of the Namib Desert Park. *Madoqua 4:* 5–68.
Tilson, R.L.; Henschel, J.R. 1986. Spatial arrangement of spotted hyaena groups in a desert environment, Namibia. *African Journal of Ecology 24:* 173–180.

Chapter 8: Botswana

C.A. Spinage, D.T. Williamson and J.E. Williamson

Introduction

Botswana lies at the centre of southern Africa's inland plateau. The country is largely flat (altitude about 1000 m), and Kalahari sands cover more than three-quarters of its surface. Hills and rocky kopjes are restricted to parts of the east and southeast. The climate is semi-arid to arid, mean annual rainfall varying from <200 mm in the southwest to >600 mm in the northeast.

The natural vegetation of the semi-arid savanna zone of northern and eastern Botswana (Fig. 1) comprises a mixture of plant communities such as Kalahari woodland, mopane (*Colophospermum mopane*) woodland, *Acacia/Terminalia* woodland, *Acacia/Dichrostachys* thorn scrub, and open grassland. Major wetland systems include the papyrus swamps and floodplains of the Kwando/Linyanti/Chobe River system in the extreme north, and the vast Okavango Delta (about 16 000 sq km) in the northwest. The latter is fed by the Okavango River from Angola, and contains a mosaic of habitats. These vary from permanent swamps to seasonally inundated areas and higher land which is permanently dry. The extent of seasonal flooding in the Okavango depends on the magnitude of the annual flood from Angola and the amount of local rainfall. In years of high flood, the overflow from the delta reaches Lake Ngami and, via the Boteti River, Lake Xau and the Makgadikgadi Pans (an extensive complex of normally dry salt pans).

The arid savanna zone of the Kalahari in central and southwestern Botswana (Fig. 1) consists of a gently undulating sand plain which is penetrated by fossil river valleys, with numerous pans (up to 200 sq km in area) which are important wildlife habitats (Parris & Child 1974). Surface water is almost entirely absent. Major habitat types in the Kalahari (Williamson & Williamson 1985) include pans and valleys (predominantly grassland with occasional clumps of trees), dunes (often covered with trees such as *Lonchocarpus, Terminalia* and *Acacia* spp., with stands of mixed shrub, e.g., *Ochna/Terminalia,* and some grassland), interdunal areas (mainly mixed shrub and grassland or open grassland, with a few areas of dense *Acacia* thicket), and plains (mainly mixed shrub and grassland).

Much of Botswana is thinly populated, especially the Kalahari. Nevertheless, man and his livestock have had a major effect on large parts of the country, including degradation of grassland, bush encroachment and elimination of surface water (Campbell & Child 1971). Over the last two decades, sinking of artificial boreholes has enabled the cattle industry to expand increasingly from the well-watered areas in the east and southeast, where it was formerly concentrated, into the Kalahari. Despite these developments, Botswana retains large antelope populations. Wildlife is an important natural resource for subsistence and commercial hunting, and forms the basis of the substantial and growing tourist industry.

Current Status of Antelopes

Typical antelope species of the semi-arid savanna zone include kudu, eland, impala, wildebeest, tsessebe, roan and sable, with waterbuck and southern reedbuck near permanent water and sitatunga and red lechwe in the Okavango and Linyanti/Chobe wetlands. The arid Kalahari savanna is inhabited by gemsbok, wildebeest, red hartebeest, springbok and eland. Some antelope species, e.g., kudu, grey duiker and steenbok, occur almost throughout in suitable habitat.

Many antelopes and other large mammals were spectacularly abundant when the first European travellers penetrated Botswana in the mid to late 19th century. The numbers of most species have declined since then, but many antelopes are still widespread and locally common or abundant, especially in and around conservation areas. Several rare species, such as mountain reedbuck, oribi and klipspringer, have restricted distributions within Botswana; the status of most species is currently satisfactory (Table 1).

Conservation Measures Taken

National parks and reserves cover >17% of Botswana's land area (Fig. 1). This system of conservation areas was established with greater regard for the avoidance of major areas of human settlement and cattle ranching than for the ecological requirements of wildlife, but it nevertheless includes representative examples of virtually all of the country's major wildlife habitats (Campbell 1973).

Chobe National Park in the northeast contains the country's largest protected area of semi-arid savanna, including extensive areas of open grassy Kalahari woodland, patches of mopane and *Acacia* woodland, open grassy plains, the floodplain of the Chobe River, and Savuti Marsh at the northern end of the Mababe Depression in the west of the park. The Savuti Marsh was formerly fed by the Savuti River, which carried the overspill of the Linyanti/Chobe floodwaters. The Savuti River channel ceased to

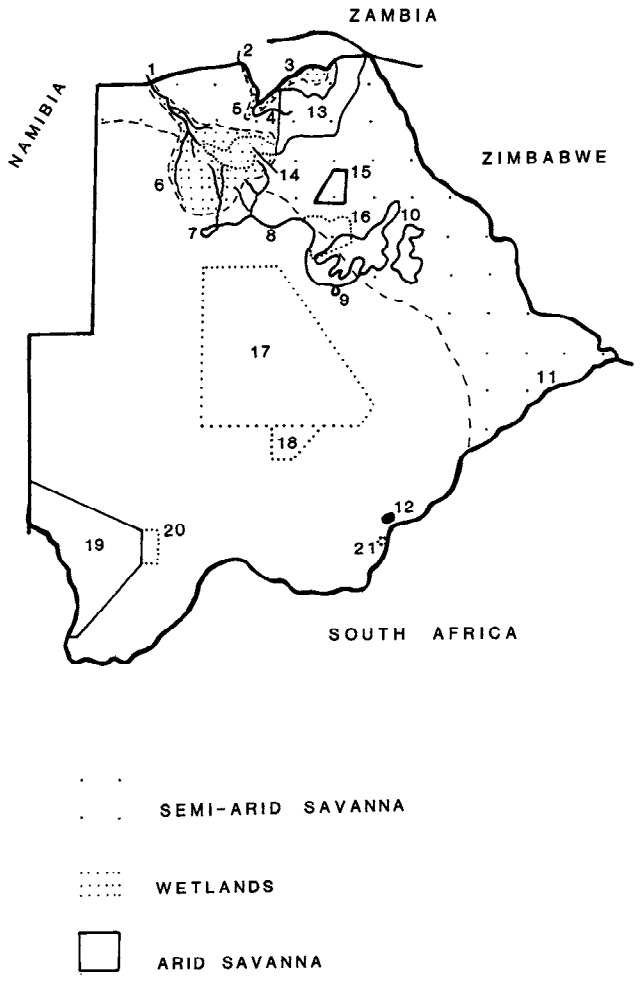

Fig. 1. Major natural vegetation zones and conservation areas of Botswana. 1: Okavango River. 2: Kwando River. 3: Linyanti/Chobe River. 4: Savuti River. 5: Linyanti Swamp. 6: Okavango Delta. 7: Lake Ngami. 8: Boteti River. 9: Lake Xau. 10: Makgadikgadi Pans. 11: Limpopo River. 12: Gaborone. Conservation areas—13: Chobe National Park (11 100 sq km). 14: Moremi Game Reserve (3880 sq km). 15: Nxai Pan National Park (2100 sq km). 16: Makgadikgadi Pans Game Reserve (3900 sq km). 17: Central Kgaligadi Game Reserve (52 800 sq km). 18: Khutse Game Reserve (2500 sq km) 19: Gemsbok National Park (24 800 sq km). 20: Mabuasehube Game Reserve (1790 sq km). 21: Mannyelanong Hill Game Reserve (1.5 sq km).

hold water during the severe droughts of the early 1980s, and the Savuti Marsh has dried out into a large grassy plain, with large seasonal populations of zebra (*Equus burchelli*) and a substantial resident population of tsessebe. Chobe protects a diverse large mammal community, including Botswana's largest elephant (*Loxodonta africana*) population and 18 of the country's 22 extant antelope species. During the dry season, when most of the pans within Chobe's woodlands dry out, water-dependent species move westwards towards the Okavango Delta or north to the permanent water of the Chobe River (Child et al. 1972; Sheppe & Haas 1976; Simpson 1978).

Moremi Game Reserve in the eastern Okavango Delta was originally established by the baTawana tribe in the early 1960s. The original reserve included the Moremi sand tongue, which is fringed with riparian woodland and largely covered by mopane and *Acacia/Terminalia* woodland and scrub, plus the floodplain of the Khwai River and a smaller area of permanent swamp. Moremi Game Reserve has subsequently been expanded to incorporate a second area of dry savanna-covered sand ridge (Chief's Island), parts of the floodplains of the M'borogha and Boro Rivers, and a greater area of permanent swamp. The enlarged reserve

Table 1
Current Status of Antelopes in Botswana

Species	Status*	Species	Status
Bushbuck	S	Gemsbok	S
Sitatunga	S	Blue Wildebeest	S
Greater Kudu	S	Red Hartebeest	S
Common Eland	S	Tsessebe	S
Grey Duiker	S	Klipspringer	R
Waterbuck	R	Oribi	R
Red Lechwe	S	Steenbok	S
Puku	R	Sharpe's Grysbok	R
Southern Reedbuck	S	Impala	S
Mountain Reedbuck	R	Springbok	S
Roan	R	Grey Rhebok	Ex
Sable	S		

* Ex = extinct; R = rare; S = satisfactory (not threatened). See Chapter 1 for definition of status categories.

covers about 20% of the total Delta area, and includes representative examples of all of the Delta's major habitats apart from papyrus swamp (Astle & Graham 1976). Moremi contains the largest surviving populations of several of the Delta's floodplain and savanna antelopes, such as red lechwe, tsessebe, wildebeest, waterbuck, southern reedbuck, kudu, sable and impala.

Nxai Pan National Park and Makgadikgadi Pans Game Reserve were established in 1970–71 to protect a range of habitats and geological features on the border between the arid Kalahari and the semi-arid northern savanna. Nxai Pan National Park contains the 14-km-wide, grass-covered pan and surrounding savanna woodland. Makgadikgadi Pans Game Reserve includes the northwestern section of the Makgadikgadi salt pans, and open grass plains, thornbush scrub and palm groves between the salt pans and the Boteti River. This area supports large migratory herds of wildebeest and zebra, which spend the wet season around Nxai Pan and the dry season on the Boteti River. Typical Kalahari antelopes such as gemsbok and springbok also occur.

Mannyelanong Hill Game Reserve near Gaborone was established in 1985. It comprises one hill within a larger area of hilly terrain, and protects one of the last colonies of the Cape vulture (*Gyps coprotheres*); two antelope species which are not found in Botswana's other conservation areas, viz., mountain reedbuck and klipspringer, have been seen there.

Large areas of the central and southwestern Kalahari are included in one national park and three game reserves (Fig 1). The vast Central Kgaligadi Game Reserve was gazetted in 1961 to protect the hunting grounds of the Bushmen. The smaller, contiguous Khutse Game Reserve, which was gazetted in 1971, includes several important pans and fossil river valleys (Dawson & Butynski 1975). Gemsbok National Park and Mabuasehube Game Reserve protect important pans and surrounding areas of the southern Kalahari, where wildlife can move without restriction from the contiguous South African Kalahari Gemsbok National Park to areas of Botswana north and east of Gemsbok National Park and Mabuasehube (Parris et al. 1977). Permanently resident animals in the Kalahari are restricted to species which can survive in the absence of surface water, such as gemsbok, springbok, red hartebeest, eland, kudu, grey duiker and steenbok. Botswana contains southern Africa's largest surviving free-ranging populations of several of these species, e.g., gemsbok, springbok, red hartebeest and eland, despite the detrimental effects of expanding human settlement, poaching (mainly from vehicles), and the severe droughts of the 1980s on much of the Kalahari's wildlife.

Several water-dependent wildlife species, e.g., zebra, elephant, buffalo (*Syncerus caffer*), impala, roan, sable and tsessebe, formerly moved into the northern Kalahari from the surrounding

savannas during periods of above-average rainfall (Campbell & Child 1971; Parris 1971; Williamson & Williamson 1984). Zebra and elephant may still enter the Central Kgaligadi Game Reserve very rarely (Williamson & Williamson 1985), but most water-dependent species are now excluded from the Kalahari by the 1200 km of veterinary cordon and other fences which have been erected along much of the perimeter of the Botswana section of the Kalahari during the last 30 years. Reduction or elimination of water-dependent species by fences appears to have substantially reduced the biomass of large herbivores in the Kalahari (Williamson & Williamson 1981, 1984). Only one water-dependent large herbivore, the blue wildebeest, survives in substantial numbers in the Kalahari, but its population has suffered a drastic decline during the severe droughts of the 1980s. The wildebeest is partially adapted to arid conditions and can obtain moisture from plant material such as green grass and tsamma melons (*Citrellus lanatus*), but in very dry seasons it requires drinking water. Access to most sources of permanent water, such as the Limpopo and Orange Rivers to the southeast and south, is now cut off by fences and settlement, leaving only very restricted access to surface water in the Lake Xau area. Heavy mortality of wildebeest often occurs during the dry season when they concentrate around Lake Xau, where the grasslands are heavily overgrazed by large herds of cattle and the wildebeest are exposed to hunting and harassment by people. This mortality was especially high in 1983, when water supplies were severely limited following 5 years of below-average rainfall. An estimated 52000 wildebeest died in the Lake Xau area between July and November 1983 (Williamson & Williamson 1985). If the Kalahari wildebeest are eventually completely cut off from access to water by additional fences, the population is unlikely to survive (Owens & Owens 1980; Williamson & Williamson 1984, 1985).

A commitment to counteract the adverse factors affecting Kalahari wildlife was provided in an announcement by the Government in July 1986, following consideration of a Government-appointed fact-finding mission. This announcement, by the Ministry of Commerce and Industry, stated that the boundaries and status of the Central Kgaligadi Game Reserve will be maintained as at present (thus rejecting pressure from some elements of the cattle industry for the southern two-thirds of the reserve to be de-gazetted), that the development of settlements within the reserve will be frozen and the people involved encouraged to move to viable sites for economic and social development outside the reserve (the people involved are the Basarwa (Bushmen), for whose benefit the reserve was originally declared to protect their way of life), that wildlife policies should be speedily implemented to facilitate faster realisation of the benefits from wildlife, that there should be an immediate and substantial increase in the reserve's staff and logistic support, and that Wildlife Management Areas adjacent to the reserve should be gazetted as soon as possible to secure seasonal access by migratory wildlife.

The Government's announcement also included recommendations for immediate steps to be taken to tap the Central Kgaligadi Game Reserve's potential for tourism, to establish boreholes within the reserve to supply water to wildlife (in 1988, a researcher working on an EEC-funded project will be monitoring the boreholes which have already been drilled in the reserve), and to fence the reserve's boundaries where necessary to exclude cattle. It was also recommended that the Director of National Parks and Wildlife should take immediate steps to develop and effect a rational national plan for wildlife conservation.

Conservation Measures Proposed

Although wildlife populations are declining in many areas and habitat degradation is increasingly widespread (e.g., Campbell & Child 1971; Parris & Child 1974; Williamson & Williamson 1985), the condition of natural habitats remains relatively pristine in large tracts of the country and in some places, e.g., the Okavango, both habitats and wildlife populations appear to be in good shape at present. With more than 17% of the country gazetted as national parks and reserves, wildlife conservation in Botswana appears very satisfactory on paper, but the activities of the Department of Wildlife and National Parks are constrained by shortages of manpower, funds and equipment. There is a need to enhance the protection and management of most of the parks and reserves, and to improve the general enforcement of the laws and regulations protecting wildlife. Development of a National Conservation Strategy and management plans for conservation areas are also important priorities.

The difficulties facing the long-term future of Botswana's populations of antelopes and other wildlife are illustrated by two of the country's major wildlife areas, the Kalahari and the Okavango. Major problems confronting wildlife conservation in the Kalahari include the lack of an integrated land-use plan for the region's orderly development, and the need for vigorous promotion of the development of wildlife-based industries for the economic benefit of local people (Williamson & Williamson 1985). Implementation of the recommendations of the Government's announcement of July 1986 on the future of the Central Kgaligadi Game Reserve will represent a major step towards overcoming these and other problems facing the conservation of Kalahari wildlife, which were highlighted by the studies of Owens & Owens (1980) and Williamson & Williamson (1984, 1985).

The Okavango Delta is one of Botswana's major natural resources, containing >95% of the country's surface water. It is also a unique inland delta with internationally important plant and animal communities, including antelopes and other large mammals (Campbell 1977). Major potential threats to the natural ecosystems of the Okavango include the expansion of cattle into the Delta in the wake of the eradication of the tsetse fly, and large-scale water removal for development schemes. Development of the Okavango is inevitable, but it should proceed gradually and without detrimental effects on the size and efficiency of the Delta's natural resources (Thompson 1976). The Government's present policy, which attempts to balance the conflicting needs of conservation and development in the Okavango, is realistic and deserves international support (Bruton & Merron 1985). This policy includes the establishment of areas with different levels of conservation protection, including a substantial additional Wildlife Management Area or game reserve which will be fenced to exclude cattle.

Botswana's natural ecosystems form part of the limited resources on which the country must base its agricultural, mining and industrial development to improve the living standards of its people. Wildlife will inevitably lose more ground as development proceeds. Greater realisation of the value of wildlife as a renewable natural resource, and enhanced protection for representative examples of the country's major natural ecosystems within the existing system of conservation areas, are essential if Botswana is to retain its rich wildlife resources into the 21st century.

Species Accounts

Knowledge of the habitat, feeding and reproduction of antelopes in Botswana was summarised by Smithers (1971, 1983). This account concentrates on the distribution, population and conservation status of each species. Additional information on habitat, food and reproduction is included from recent studies of sitatunga, gemsbok, blue wildebeest, red hartebeest and springbok in Botswana. Estimated populations are based on aerial surveys

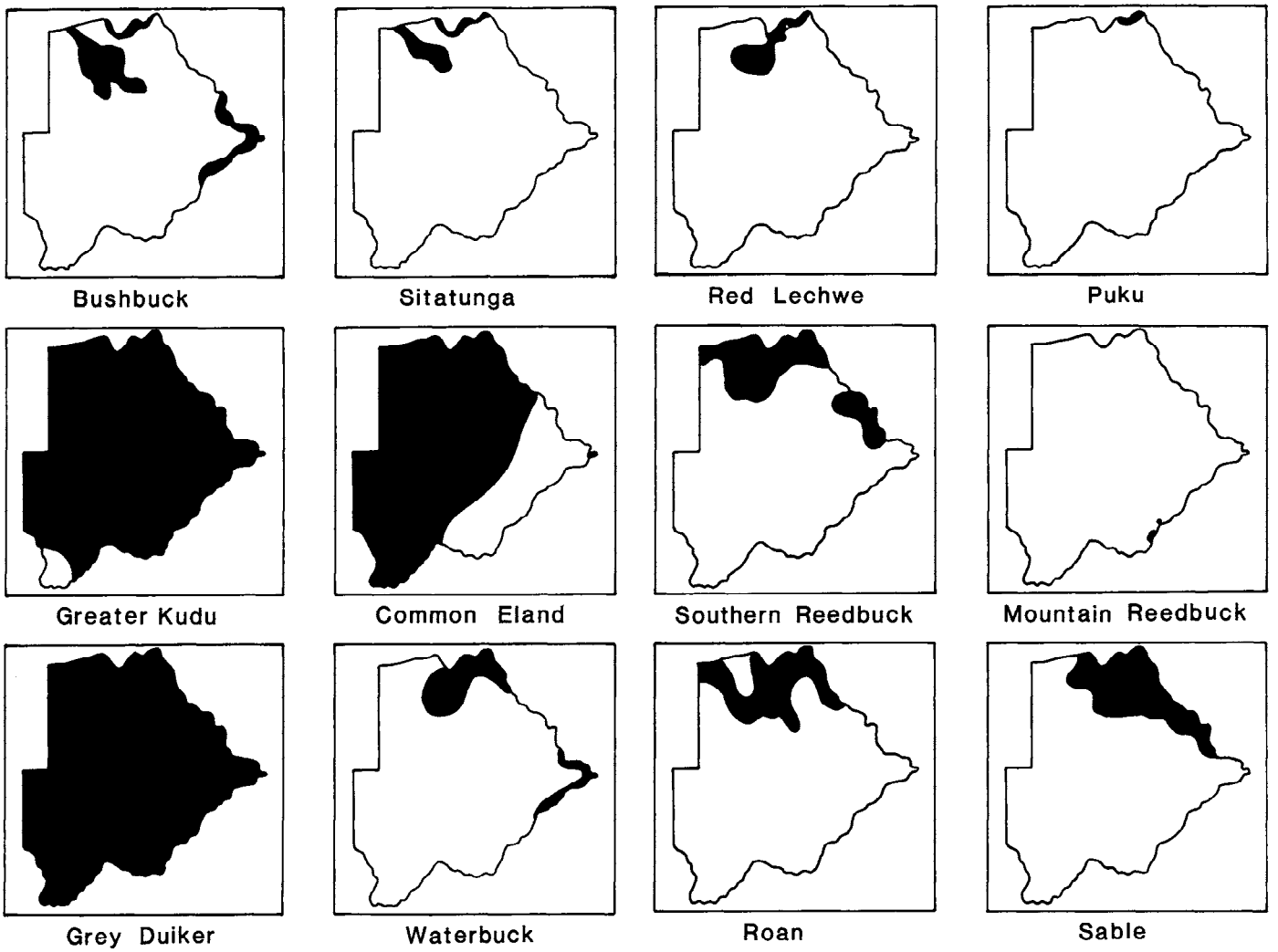

Fig. 2. Distribution of antelopes in Botswana (based on Smithers (1968, 1983) and recent observations by C.A. Spinage). Shaded areas represent the approximate limits of the present distribution, not the area of continuous occurrence.

conducted by the Department of Wildlife and National Parks between November 1986 and March 1987 unless otherwise stated. These population estimates have wide confidence intervals and should be regarded as minimal estimates. The recent succession of drought years has led to a marked decline in the numbers of many antelope species. Botswana has a drought cycle of approximately 20 years, and antelope populations which have declined could be expected to recover partially over the next decade if rainfall follows an upward trend.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Confined to riverine woodland and bushland adjacent to permanent water, in the Okavango Delta, along the Linyanti/Chobe River, on the Boteti River, and in parts of the east (Fig. 2). Numbers unknown, but locally common, e.g., on the lower Limpopo (Tuli Block farms).

Status: Satisfactory (not threatened).

Conservation Measures Taken: Occurs in Chobe National Park (common in riparian woodland, e.g., along the Chobe River in the northeast of the park) and Moremi Game Reserve. Recorded from the Boteti River in the area of Makgadikgadi Game Reserve (Smithers 1968), but it is not known if it is still present there.

Sitatunga (*Tragelaphus spekii*)

Distribution & Population: Occurs in the Okavango Delta, from the "panhandle" section along the Okavango River south to the central parts of the Delta, in the Linyanti Swamp, and in swampy areas on the Chobe River (Fig. 2). Games (1983) estimated a population density of 0.78 per sq km within a 300 sq km survey area on the Shakawe floodplain in the northern Okavango panhandle. Extrapolation of this estimate suggests a total population of at least several thousand in the Delta. It is also common in the Linyanti Swamp (Williamson 1986).

Habitat, Food & Reproduction: Restricted to perennial swamp, to which it is morphologically and behaviourally adapted. Studies of sitatunga in the Okavango (Games 1983) and Linyanti Swamp (Williamson 1986) have shown that it usually occurs singly or in pairs, but often forms loose groups of up to 8 animals which show little individual interaction. Ritualized dominance interactions occur between males. It is basically sedentary, resting on flattened areas within reedbeds from which it moves onto surrounding areas during the morning, late evening, and at night. It makes extensive use of inter-connected path systems in large beds of papyrus and reeds. Seasonal movement and feeding patterns are influenced by the annual flood regime, which forces sitatunga out of the reedbeds on to flooded grasslands at the swamp fringe during high water. It is a relatively non-selective feeder, utilising a large proportion of the available swamp vegetation and aquatic grasses. Calving peaks in June–July (Smithers 1983), which suggests that mating occurs during the rains (Williamson 1986).

Status: Satisfactory at present. The sitatunga's long-term survival in the Okavango could be threatened by reduction of its swamp habitat through artificial reduction in water flow, and increasing utilisation of the swamp fringe by cattle (Games 1983).

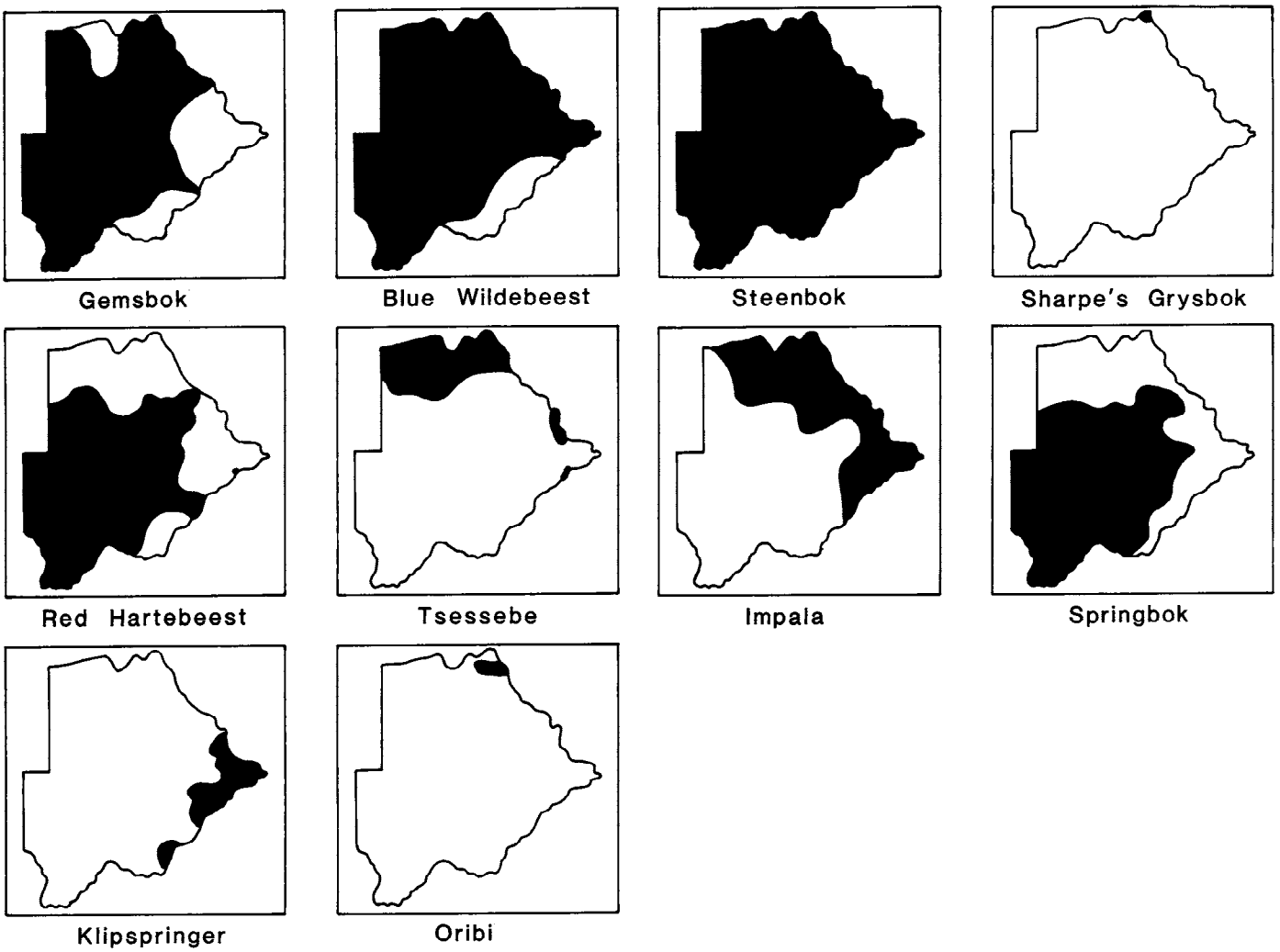

Fig. 2. Distribution of antelopes in Botswana—continued.

Conservation Measures Taken: Occurs in moderate numbers in Moremi Game Reserve, which contains a limited area of permanent swamp, and in swamps on the northern boundaries of Chobe National Park.

Conservation Measures Proposed: Expansion of the protected area within the Okavango Delta to include a substantial example of papyrus, and extension of Chobe National Park to incorporate part of the Linyanti Swamp would benefit this species (Campbell 1973).

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Widespread in scrub and light woodland; scarce or absent in parts of the southwestern Kalahari (Fig. 2). Common in many areas of the semi-arid savanna zone. Occurs at lower densities in the Kalahari, mainly in dune woodland. Total population estimated to be 13 000 (likely to be an underestimate).

Status: Satisfactory.

Conservation Measures Taken: Probably occurs in all of the conservation areas shown in Fig. 1. Common in Chobe National Park. Occurs in moderate numbers within Moremi Game Reserve, Nxai Pan National Park and Makgadikgadi Pans Game Reserve (population about 160), with >1000 in the total area of the Central Kgaligadi and Khutse Game Reserves. Uncommon to rare in Gemsbok National Park/Mabuasehube Game Reserve (Parris & Child 1974); an aerial survey in November 1986 produced a population estimate of 160 for Gemsbok National Park and no kudu were observed in Mabuasehube Game Reserve.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Widespread, but no longer occurs in the settled areas of the east apart from an estimated population of 640 in the extreme east (Fig. 2). Generally uncommon to scarce and highly mobile, ranging over enormous areas. The total population is estimated to be 24 300.

Status: Satisfactory.

Conservation Measures Taken: Occurs in small to moderate numbers in Chobe National Park and, at least seasonally, in Nxai Pan National Park and Makgadikgadi Pans Game Reserve. Rare (vagrant only) in Moremi Game Reserve. Substantial numbers occur in Gemsbok National Park (estimated population 4380) and the Central Kgaligadi Game Reserve. An average population of 650 was estimated from 11 aerial surveys of an 11 500 sq km area in the northern section of the Central Kgaligadi Game Reserve between April 1981 and February 1983 (Williamson & Williamson 1981, 1985 and unpublished), suggesting a total population in the low thousands in this reserve at that time. The total population in the Central Kgaligadi Reserve in March-April 1987 was estimated to be 4800.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Occurs throughout at moderate to low densities wherever there is sufficient cover of bushes or tall

grass (Fig. 2). The total population estimate for the country (37 900) is a minimal figure.

Status: Satisfactory.

Conservation Measures Taken: Resident populations of this species occur in all of the conservation areas shown in Fig. 1, with the possible exception of Mannyelanong Hill Game Reserve. Population estimates from aerial surveys include 20 (Makgadikgadi Pans Game Reserve), 140 (Khutse Game Reserve), and 3980 (Central Kgaligadi Game Reserve). These figures are likely to be gross underestimates. Duiker are very difficult to see from the air because they are small, cryptically coloured and favour dense scrub.

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: Confined to savanna grasslands near permanent water in the eastern and southern Okavango Delta, the northeast, and marginally in the east where it is quite common on the lower Limpopo (Fig. 2). The total population is estimated to be about 900.

Status: It may be vulnerable, in view of its small numbers both within and outside conservation areas and the apparent decline of some protected populations (e.g., Sheppe & Haas 1976). However, it is classed as rare, since its numbers are not known to have declined significantly in recent years.

Conservation Measures Taken: Occurs in small to moderate populations in Chobe National Park (grasslands along the Chobe River in the northeast of the park, south to pan areas in the central part of the park) and Moremi Game Reserve (locally common along the Khwai River in the north of the reserve).

Puku (*Kobus vardoni*)

Distribution & Population: This species reaches the southern limit of its continental distribution in northeastern Botswana, where it was formerly numerous along the Chobe/Linyanti River but is now reduced to a small relic population on the floodplain of the Chobe (Fig. 2). This population was reported to be <100 but stable by Child & von Richter (1969) and Sheppe & Haas (1976). It is unlikely to have increased since then.

Status: Rare. The small, isolated Botswana population may not be large enough to be viable in the long term.

Conservation Measures Taken: The Botswana population is protected within Chobe National Park, but an increase in numbers is restricted by the limited extent of suitable floodplain habitat within the park.

Red Lechwe (*Kobus leche leche*)

Distribution & Population: Occurs in two more or less distinct populations within Botswana (Williamson 1981), in the Okavango Delta (>20 000 animals) and in the Linyanti Swamp (several thousand animals) (Fig. 2). The range of the latter population extends eastwards along the Linyanti/Chobe River system and northwards into the Caprivi Strip of Namibia. Total numbers were estimated to be 28 600 in 1986–87.

Status: Satisfactory at present. The Okavango contains the largest extant population of this subspecies. Its long-term survival will depend on effective protection of a substantial area of its floodplain/swamp margin habitat.

Conservation Measures Taken: Common to abundant in seasonally inundated areas within Moremi Game Reserve (population >2400). Moves onto the Chobe River floodplain in the northeast of Chobe National Park in the dry season, returning to the eastern Caprivi at the height of the annual floods; this population has declined markedly from its former abundance (estimated numbers up to several hundred in 1986–87), probably because of heavy hunting pressure and overgrazing of the Chobe floodplain (Child & von Richter 1969; Child 1975; Sheppe & Haas 1976).

Conservation Measures Proposed: The future of the lechwe population of the Botswana section of the Linyanti Swamp will depend on the development of an ecologically based and legally enforceable land-use plan which recognises the importance of conserving the Linyanti ecosystem (Williamson 1981).

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Occurs in areas with sufficient cover of tall grass or reedbeds near permanent water in the north, and along the Zimbabwe border in the east (Fig. 2). Suitable habitat for this species is restricted within Botswana and its population is not large (estimated total numbers about 1700).

Status: Satisfactory, as long as effective protection is maintained within conservation areas. In the long term, it may not survive outside conservation areas because of competition with cattle for food and water. It may have been adversely affected within some protected areas by habitat degradation resulting from heavy utilisation by wild herbivores (e.g., Simpson 1978).

Conservation Measures Taken: Not uncommon in Moremi Game Reserve (>140). Occurs locally in moderate numbers within Chobe National Park (the relic population in dry country adjacent to the now dry Savuti channel was in very poor condition in September 1987 and is unlikely to survive unless the area receives heavy rainfall in the near future).

Mountain Reedbuck (*Redunca fulvorufula*)

Distribution & Population: Confined to localised areas of stony, grassy hillsides in the southeast (Fig. 2). The population is unlikely to exceed a few hundred.

Status: Rare.

Conservation Measures Taken: Occurs in the recently gazetted Mannyelanong Hill Game Reserve, where it may not be permanently resident.

Roan (*Hippotragus equinus*)

Distribution & Population: Occurs at low densities in the northern semi-arid savannas (Fig. 2). The total population is about 1000 animals.

Status: Rare. There is concern for this species' long-term survival within Botswana. Its populations within conservation areas are small, and in some cases may have declined (e.g., Simpson 1978).

Conservation Measures Taken: Widespread but uncommon within Chobe National Park (>100). Occurs in small numbers in Moremi Game Reserve (>30) and perhaps in Makgadikgadi Pans Game Reserve (15 reported to have been seen).

Sable (*Hippotragus niger*)

Distribution & Population: Occurs in the northern and northeastern semi-arid savannas; not recorded west of the Okavango Delta (Fig. 2). Formerly occurred in the east on the lower Limpopo, where the last known animal died during the 1960s drought. The total population is about 3000.

Status: Satisfactory at present.

Conservation Measures Taken: Quite common locally within Chobe National Park (>900) and Moremi Game Reserve.

Gemsbok (*Oryx gazella gazella*)

Distribution & Population: Widespread in the more arid areas; absent from the east and southeast except where Kalahari associations extend to the Transvaal border (Fig. 2). Wanderers may occur outside this range, e.g., a stray individual was seen recently in the extreme east. The total population is estimated to be 105 600.

The numbers of this species have been largely unaffected by the recent sequence of drought years.

Habitat, Food & Reproduction: Open grassy areas such as pans and valleys appear to be the preferred habitat of gemsbok in the Kalahari (Williamson & Williamson 1985). Large herds congregate on pans and valleys after heavy rainfall. During hot, dry periods, gemsbok move into more densely wooded habitats such as dunes and interdunal areas where food, moisture and shade are more readily available. They are predominantly grazers, browsing very little, and obtain their moisture requirements in the dry season by digging up underground plant storage organs. Gemsbok are able to meet their survival needs within a relatively small area in the Kalahari, even during severe droughts. Observations of radio-collared individuals revealed mean annual ranges of 127 sq km for females and 31 sq km for males (Williamson & Williamson 1985). Males may occupy some form of territory. Herd size varies from 5 to 30 in the southern Kalahari (Parris 1971), and from 2 to 80–90 in the northern Kalahari. Calves were seen in all months of the year during the study by Williamson & Williamson (1985) in the northern Kalahari, with an apparent peak in the hot dry season (September–October). Fringe-eared oryx also seem to calve at the beginning of the hot dry season (Leuthold & Leuthold 1975).

Status: Satisfactory, although illegal hunting may have substantially reduced numbers in the northern Kalahari (Williamson & Williamson 1985).

Conservation Measures Taken: The major protected populations occur in the Central Kgaligadi Game Reserve (18 700) and Gemsbok National Park (34 200). The gemsbok also occurs in Nxai Pan National Park, Makgadikgadi Pans (about 360), Khutse (about 1200) and Mabuasehube (about 5000) Game Reserves. It is present occasionally in small numbers in Chobe National Park.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: Occurs widely, but absent from the more densely settled areas in the east (Fig. 2). Numbers have declined markedly during the droughts of the 1980s, especially in the Kalahari which formerly supported Africa's second largest population of this species (outnumbered only by the Serengeti population). The total wildebeest population in Botswana is currently estimated to be 38 700, compared to hundreds of thousands in the 1970s. It remains common in some parts of its range.

Habitat, Food & Reproduction: Prefers open grassland or light woodland. Predominantly a grazer. Unlike species which are completely independent of standing water, such as gemsbok, springbok and red hartebeest, wildebeest are forced to undertake large-scale movements in drought years to gain access to permanent water. Substantial numbers enter the Okavango Delta in dry periods. A population numbering in the thousands to low tens of thousands moves north to the Nxai Pan area in the wet season and concentrates on the Boteti River in the dry season. In the Kalahari, at least a significant fraction of the wildebeest population is migratory in periods of low rainfall, moving northwards to Lake Xau to obtain water in the dry season and returning southwards into the Kalahari at the onset of the wet season (Williamson & Williamson 1985). It is possible that these animals migrate to the mineralised pans of the southern Kalahari in the wet season, to obtain access to mineral licks. The southward migration occurs at precisely the time when calving is imminent and females have their greatest need for minerals (Williamson & Williamson 1985). Not all of the Kalahari wildebeest follow this migration pattern. Some animals remain in the Kalahari in dry periods, but it is not known how they survive.

Status: The species' survival in Botswana is not threatened but some populations are becoming increasingly vulnerable, especially in the Kalahari because of restriction of access to permanent water in dry periods by veterinary cordon and other fences. Large-scale migrations of tens of thousands of wildebeest passed through the northern section of the Central Kgaligadi Game Reserve, en route to Lake Xau, in each dry season (June–August) from 1981 to 1983, but <1000 animals moved north to Lake Xau in 1984 (Williamson & Williamson 1985). This could have reflected improved moisture conditions in the southern Kalahari, e.g., the heavy late rains which fell in parts of the southern Kalahari in 1984 may have removed the need for a northward migration. Alternatively, there may be distinct wildebeest subpopulations in the Kalahari and the one which migrates to the north may have been largely wiped out by the massive mortality which occurred at Lake Xau in 1983 (Williamson & Williamson 1985).

Conservation Measures Taken: Central Kgaligadi/Khutse Game Reserves and Gemsbok National Park/Mabuasehube Game Reserve protect substantial areas of the wildebeest's range in the Kalahari, but many of these animals move outside protected areas in some seasons. The Makgadikgadi population is reasonably well protected in Makgadikgadi Pans Game Reserve (an estimated 11 540 were present in this reserve in February 1987) and Nxai Pan National Park, as long as its seasonal movements are unrestricted between these conservation areas. The wildebeest is also common in Chobe National Park (>160) and Moremi Game Reserve (>200).

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Population: Widespread in the arid savanna of the Kalahari, extending to the Zimbabwe border in the northeast and the Transvaal border in the southeast, with a few on the lower Limpopo (Fig. 2). The total population is estimated to be 47 800.

Habitat, Food & Reproduction: Occurs on dry grassland or floodplains. Mainly a grazer. Well adapted to dry conditions, obtaining its moisture requirements from green grass, melons, and by digging for underground plant storage organs. Herds vary in size from 10 to 10 000 or more, and move over wide areas. Very large herds are probably temporary aggregations. Hartebeest numbers in the northern Central Kgaligadi Game Reserve were highest during the dry season from 1981 to 1984, suggesting a pattern of seasonal migration (Williamson & Williamson 1985). Calving occurs mainly in the early wet season (October–November) (Smithers 1971).

Status: Satisfactory. This species has suffered considerable mortality along the fences which now border most of the Kalahari, but it has been affected less severely than the wildebeest.

Conservation Measures Taken: Common in the Central Kgaligadi Game Reserve. In 1981–83, the average population was about 1200 in an 11 500 sq km survey area in the north of this reserve, with a total population in the reserve of several thousand to tens of thousands in some seasons (Williamson & Williamson 1981, 1985 and unpublished); an estimated 5020 were present in the Central Kgaligadi Game Reserve in March–April 1987. It is also common in Khutse Game Reserve (occurs seasonally but does not usually breed there (Dawson & Butynski 1975); estimated population 300 in March 1987), Gemsbok National Park (estimated population 2840 in November 1986), and Mabuasehube Game Reserve (population about 100). Occurs in low to moderate numbers in Nxai Pan National Park and Makgadikgadi Pans Game Reserve (population about 40).

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Northern Botswana is one of this antelope's last major strongholds (Child et al. 1972), and it also occurs on farmland in the east including a small population (in the low hundreds) on the lower Limpopo (Fig. 2). The total population is estimated to be 9800, with the largest numbers in the Okavango Delta.

Status: Satisfactory.

Conservation Measures Taken: Common in Moremi Game Reserve (>600) and Chobe National Park (>500).

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Confined to rocky kopje areas in the east and southeast (Fig. 2). Numbers unknown, but not uncommon locally.

Status: Rare.

Conservation Measures Taken: Occurs in Mannyelanong Hill Game Reserve.

Oribi (*Ourebia ourebi*)

Distribution & Population: Restricted to a small area in the northeast, extending westwards from the Kazuma Pan on the Zimbabwe border to the eastern part of Chobe National Park (Fig. 2). Numbers unknown, but unlikely to exceed a few hundred.

Status: Rare.

Conservation Measures Taken: Occurs in small numbers on pans in the east of Chobe National Park.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Widespread and common throughout (Fig. 2). Total population estimated to be 20 800, which is undoubtedly a minimal figure.

Status: Satisfactory.

Conservation Measures Taken: Occurs in Chobe, Nxai Pan (common), and Gemsbok National Parks, and Moremi (localised within areas of sand ridge), Makgadikgadi Pans (an estimated 340 in June 1987), Central Kgaligadi (very common, at least in the north (Williamson & Williamson 1985); estimated population 1200 in March–April 1987), Khutse (estimated population 60), and Mabuasehube Game Reserves. As for grey duiker, population estimates based on aerial counts are probably gross underestimates.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Within Botswana, this species has only been recorded from the extreme northeast (Fig. 2). Its numbers are unknown, but small.

Status: Rare.

Conservation Measures Taken: Occurs in small numbers in the Kasane area in the northeast of Chobe National Park.

Impala (*Aepyceros melampus*)

Distribution & Population: Widespread in the semi-arid savannas of the northeast (Fig. 2). Formerly penetrated into the eastern parts of the Kalahari along fossil riverbeds fringed with *Acacia* woodland or scrub (Smithers 1983), but now occurs only as a rare vagrant in the Kalahari. Occurred in small numbers near water in the Lake Xau region up until 1984. The total population is estimated to be 48 300.

Status: Satisfactory.

Conservation Measures Taken: Common in Moremi Game Reserve (>3600) and Chobe National Park (>2600).

Springbok (*Antidorcas marsupialis*)

Distribution & Population: Occurs mainly in the arid savannas of the Kalahari, as far north as Lake Ngami, Nxai Pan and the Makgadikgadi Pans (Fig. 2). The total population estimate is 101 800.

Habitat, Food & Reproduction: Springbok are closely associated with pans and valleys, where they graze during the wet season (Williamson & Williamson 1985). Herd size varies from 10 to >500. Rutting males are highly territorial. Numbers on pans and valleys peak in the wet season, in a similar manner to gemsbok. In the dry season, springbok obtain most of their moisture requirements by browsing, with a limited amount of digging for underground plant storage organs. Springbok range over considerably larger areas than gemsbok, particularly in the dry season when the distances moved are greatest (Williamson & Williamson 1985). The reliance of springbok on browse for their moisture requirements probably forces them to move greater distances than gemsbok. Whereas browse is patchily distributed in the Kalahari and is often in the form of small bushes which may be rapidly depleted, the underground storage organs which gemsbok utilise are often massive (possibly up to 1000 kg or more) and can occur in dense patches. There is no evidence of large-scale seasonal migration by springbok in the northern Kalahari (Williamson & Williamson 1985). Most calves are born between January and March (Williamson 1987).

Status: Satisfactory.

Conservation Measures Taken: Common in the Central Kgaligadi Game Reserve (in 1981–83, there was an estimated average population of 3600 in an 11 500 sq km survey area in the northern section of this reserve (Williamson & Williamson 1981, 1985 and unpublished); in 1987, the total population in the reserve was estimated to be 9660), Khutse Game Reserve (population about 360), Gemsbok National Park (population about 2200), and Mabuasehube Game Reserve (population about 120). It is also common in Makgadikgadi Pans Game Reserve (population estimates 1900 in February 1987 and 6600 in June 1987) and Nxai Pan National Park.

Grey Rhebok (*Pelea capreolus*)

Distribution & Status: It is highly likely that this species formerly occurred in hilly country around Gaborone in the southeast (Shortridge 1934; Smithers 1983). It no longer occurs in Botswana, although it is still present in the western Transvaal.

Additional Species

Two antelope species which were formerly absent from Botswana now occur. The nyala (*Tragelaphus angasii*) has been recorded recently in the extreme eastern tip of the country and at another site on the lower Limpopo. These animals probably originated from the adjacent northwestern Transvaal, where the nyala has been introduced to farmland outside the species' natural range. Small numbers of blesbok (*Damaliscus dorcas phillipsi*) have been introduced to farmland in eastern and western Botswana (current population about 130).

References

Astle, W.L.; Graham, A. 1976. Ecological investigations of the UNDP in the Okavango Delta. *Proceedings of the Okavango Delta Symposium, Gaborone:* 81–91.

Bruton, M.N.; Merron, G.S. 1985. The Okavango Delta—give credit where credit is due. *African Wildlife 39*(2): 59–63.

Campbell, A.C. 1973. The national park and reserve system in Botswana. *Biological Conservation 5:* 7–14.

Campbell, A.C. 1977. The Okavango. *African Wildlife 31*(5): 12–27.

Campbell, A.C.; Child, G. 1971. The impact of man on his environment in Botswana. *Botswana Notes & Records 3:* 91–110.

Child, G. 1975. The decline of a lechwe population. *Mammalia 39:* 706.

Child, G.; von Richter, W. 1969. Observations on the behaviour and ecology of lechwe, puku and waterbuck along the Chobe River, Botswana. *Zeitschrift fur Saugetierkunde 34:* 275–295.

Child, G.; Robbel, H.; Hepburn, C.P. 1972. Observations on the biology of tsessebe, *Damaliscus lunatus lunatus,* in northern Botswana. *Mammalia 36:* 343–387.

Dawson, J.L.; Butynski, T.M. 1975. Khutse Game Reserve, Botswana:

preserving the Kalahari ecosystem. *Biological Conservation 7:* 147–153.
Games, I. 1983. Observations on the sitatunga *Tragelaphus spekei selousi* in the Okavango Delta of Botswana. *Biological Conservation 27:* 157–170.
Leuthold, W.; Leuthold, B.M. 1975. Temporal patterns of reproduction in ungulates of Tsavo East National Park, Kenya. *East African Wildlife Journal 13:* 159–169.
Owens, M.; Owens, D. 1980. The fences of death. *African Wildlife 34*(6): 25–27.
Parris, R. 1971. The ecology and behaviour of wildlife in the Kalahari. *Botswana Notes & Records Special Edition 1:* 96–107.
Parris, R.; Child, G. 1974. The importance of pans to wildlife in the Kalahari and the effect of human settlement on these areas. *Journal of the Southern African Wildlife Management Association 3:* 1–8.
Parris, R.; Bothma, J. du P.; Boshoff, A.F.; Waanders, E. 1977. Preliminary map of the south western Kalahari Desert. *Koedoe 20:* 163–165.
Sheppe, W.; Haas, P. 1976. Large mammal populations of the lower Chobe River, Botswana. *Mammalia 40:* 223–243.
Shortridge, G.C. 1934. The mammals of South West Africa. Vols. I & II. London, Heinemann.
Simpson, C.D. 1978. Effects of elephant and other wildlife on vegetation along the Chobe River, Botswana. *Occasional Paper Museum Texas Tech University No. 48.*
Smithers, R.H.N. 1968. A check list and atlas of the mammals of Botswana. Salisbury, Trustees of the Museums of Rhodesia.
Smithers, R. H.N. 1971. The mammals of Botswana. *Memoir of the National Museums & Monuments of Rhodesia No. 4.*
Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.
Thompson, K. 1976. The Okavango Delta and its future utilisation: an attempt at a synthesis of the proceedings. *Proceedings of the Okavango Delta Symposium, Gaborone:* 3–12.
Williamson, D.T. 1981. The status of red lechwe in the Linyanti Swamp. *Botswana Notes & Records 13:* 101–105.
Williamson, D.T. 1986. Notes on sitatunga in the Linyanti Swamp, Botswana. *African Journal of Ecology 24:* 293–297.
Williamson, J.E. 1987. Aspects of the behavioural ecology of springbok (*Antidorcas marsupialis* Zimmermann 1780) in the Central Kalahari Game Reserve, Botswana. Unpublished M.Sc. thesis, University of the Witwatersrand.
Williamson, D.T.; Williamson, J.E. 1981. An assessment of the impact of fences on large herbivore biomass in the Kalahari. *Botswana Notes & Records 13:* 107–110.
Williamson, D.; Williamson, J. 1984. Botswana's fences and the depletion of Kalahari wildlife. *Oryx 18:* 218–222.
Williamson, D.T.; Williamson, J.E. 1985. Kalahari ungulate movement study final report. Report to Frankfurt Zoological Society.

Chapter 9: Zimbabwe

V.J. Wilson and D.H.M. Cumming

Introduction

Zimbabwe consists largely of a series of plateaux, 900–1500 m in altitude, with more rugged terrain in parts of the east and northeast. The eastern highlands form a narrow belt of mountains and high plateaux, formerly covered by montane and submontane evergreen forest, grassland, and heath-like scrub, but now extensively modified by commercial agriculture and exotic forestry plantations. Much of the plateau above 1000 m (highveld) originally supported *Brachystegia* woodland, with open grassy vleis along drainage lines. This region is now used largely for commercial farming (Fig. 1).

The most extensive remaining wildlife habitats unmodified by man are in the lower altitude border regions of the north, west and southeast (Fig. 1), where mean annual rainfall is <600 mm (<400 mm in the southeast) compared to 600–800 mm over most of the highveld and >1000 mm in the eastern highlands. An extensive area of Kalahari sand in the west (altitude about 1000 m) supports various types of savanna woodland, e.g., *Baikiaea/Pterocarpus, Burkea/Terminalia,* and *Acacia,* with *Combretum* and *Terminalia* scrubland. Land below 900 m in altitude (lowveld) is most extensive in the Sabi and Limpopo Basins of the southeast, where it consists mainly of gently undulating terrain between widely spaced rivers. The lowveld of the Zambezi Valley is more limited, and is separated from the rest of the country by steep escarpments and rugged hills. Characteristic vegetation of the lowveld includes mopane (*Colophospermum mopane*) savanna, *Commiphora/Combretum* thickets, and *Acacia* woodland, intergrading into *Brachystegia* woodland on escarpments and broken hilly country.

Wildlife is regarded as a valuable economic resource in Zimbabwe (Cumming 1981; Child 1984). National parks and other wildlife land cover almost 12% of the country, with a further 4% in state forestry land (Fig. 1). Despite some limitations of manpower and equipment within the Department of National Parks and Wild Life Management, Zimbabwe's conservation areas are regarded as among the best managed and most effectively protected in Africa (MacKinnon & MacKinnon 1986). The level of protection is illustrated by the fact that Zimbabwe was the only country in Africa to record a significant increase in its population of black rhinoceros (*Diceros bicornis*), the continent's most vulnerable large mammal to poaching, between 1980 and 1984 (Western & Vigne 1985). The Department of National Parks and Wild Life Management is currently engaged in a vigorous campaign to counteract rhinoceros poaching in the Zambezi Valley (Anon. 1985).

Current Status of Antelopes

Many antelope species still occur widely in Zimbabwe both within and outside conservation areas, although some species, such as eland, roan and sable, have been eliminated from much of the *Brachystegia* woodland of the highveld, except where reintroduced. While some poaching occurs in conservation areas, it is generally not at a level which is likely to cause significant reductions of antelope populations. The greatest long-term threat to the survival of antelopes and other wildlife is the rapid growth of Zimbabwe's human population and the consequent expansion of settlement and increase in domestic livestock numbers. Eradication of tsetse fly, for example, has resulted in a rapid decline in the status of most antelope species in the Communal Farming areas of the Zambezi Valley. On the other hand, with an increasing interest in game ranching, the distribution of many species is expanding again in the commercial farming areas. At least one antelope species which does not occur naturally in Zimbabwe,

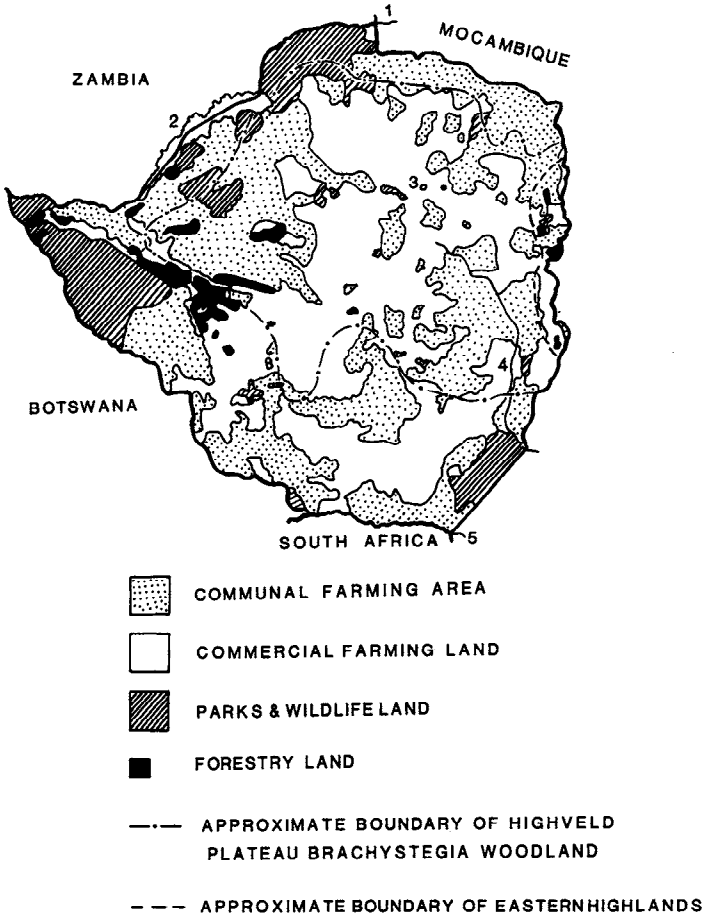

Fig. 1. Major land categories of Zimbabwe. 1: Zambezi River. 2: Lake Kariba. 3: Harare. 4: Sabi River. 5: Limpopo River.

the blesbok (*Damaliscus dorcas phillipsi*), has been introduced to some farms.

The overall status of antelopes is generally satisfactory at present (Table 1). Roan and oribi are classed as vulnerable in view of their small numbers and restricted distributions, but their survival is not threatened in the short or medium term. Among the species classed as rare in Table 1, nyala, gemsbok and suni occur very locally but probably in stable or increasing populations, while sitatunga, puku and red hartebeest only occur as occasional vagrants in Zimbabwe.

Table 1
Current Status of Antelopes in Zimbabwe

Species	Status*	Species	Status
Nyala	R	Gemsbok	R
Common Eland	S	Blue Wildebeest	S
Bushbuck	S	Red Hartebeest	R
Sitatunga	R	Lichtenstein's Hartebeest	En
Greater Kudu	S	Tsessebe	S
Blue Duiker	I	Klipspringer	S
Natal Red Duiker	K	Oribi	V
Grey Duiker	S	Steenbok	S
Waterbuck	S	Sharpe's Grysbok	S
Puku	R	Suni	R
Southern Reedbuck	S	Impala	S
Roan	V		
Sable	S		

* En = endangered; R = rare; V = vulnerable; I = indeterminate (i.e., endangered, rare, or vulnerable); K = insufficiently known; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

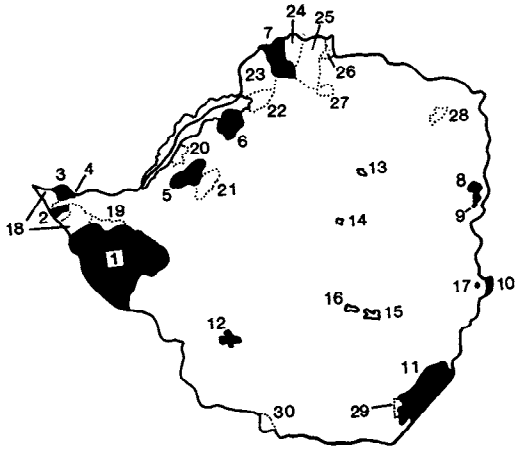

Fig 2. Conservation areas of Zimbabwe of major importance to antelope conservation. National parks—1: Hwange (14 650 sq km). 2: Kazuma Pan (313 sq km). 3: Zambezi (564 sq km). 4: Victoria Falls (19 sq km). 5: Chizarira (1910 sq km). 6: Matusadona (1370 sq km). 7: Mana Pools (2196 sq km). 8: Nyanga (289 sq km). 9: Mtarazi Falls (25 sq km). 10: Chimanimani (171 sq km). 11: Gonarezhou (5053 sq km). 12: Matobo (432 sq km). Recreational parks—13: McIlwaine (61 sq km). 14: Ngezi (58 sq km). 15: Kyle (169 sq km). Sanctuaries—16: Mushandike (61 sq km). 17: Melsetter (12 sq km). Safari areas—18: Matetsi (2920 sq km). 19: Deka (510 sq km). 20: Chete (1081 sq km). 21: Chirisa (1713 sq km). 22: Charara (1700 sq km). 23: Urungwe (2880 sq km). 24: Sapi (1180 sq km). 25: Chewore (3390 sq km). 26: Dande (523 sq km). 27: Doma (760 sq km). 28: Umfurudzi (760 sq km). 29: Malapati (162 sq km). 30: Tuli (404 sq km).

Conservation Measures Taken

Zimbabwe's protected areas of natural habitat of major importance to antelope conservation are shown in Fig. 2. National parks comprise generally large areas which are relatively unmodified by man and support diverse plant and animal communities. The main objective of the national parks is to preserve and protect representative examples of the country's major natural biotic communities. The smaller recreational parks are normally situated in close proximity to urban centres and include features (e.g., dams and artificial lakes) of recreational value. Sanctuaries contain unusually diverse, abundant or rare animal species. Safari areas are set aside for outdoor recreational pursuits such as camping, sport hunting, fishing and game viewing.

This system of protected areas includes representative examples of all of the country's major antelope habitats. Hwange (formerly Wankie) National Park was established in 1928 and includes extensive areas of *Baikiaea/Pterocarpus, Burkea/Terminalia* and *Combretum* woodland and scrub savanna on Kalahari sand, with mopane and *Acacia* woodland on basalt and other soils in the north and south (Wilson 1975). The adjacent Matetsi and Deka Safari Areas and Zambezi National Park contain mainly mopane savanna and *Baikiaea* woodland. Kazuma Pan National Park comprises a large, seasonally inundated grassy depression surrounded by *Acacia nilotica* shrub savanna, mopane woodland and Kalahari sand woodlands. The Hwange-Deka-Matetsi-Kazuma Pan-Zambezi area, with contiguous forest reserves, comprises one of the largest areas of protected savanna habitats in Africa (total area >19 000 sq km) and supports viable populations of at least 16 of the 24 antelope species which occur naturally in Zimbabwe.

The middle Zambezi Valley conservation areas, Mana Pools National Park and the contiguous Charara, Urungwe, Sapi, Chewore, Dande and Doma Safari Areas (about 12 000 sq km), plus Zambia's Lower Zambezi National Park on the north bank of the river, also comprise one of Africa's major protected natural areas

(Du Toit 1984). The key habitat feature of the Mana/Chewore area is Zimbabwe's largest and most valuable example of *Acacia albida/A. tortilis* riparian woodland on alluvial terraces. The riparian woodlands, mopane savanna, and *Commiphora/Combretum* thickets of the middle Zambezi Valley, intergrading into *Brachystegia* woodland on the escarpment, support substantial populations of at least 12 antelope species. Chete Safari Area, Matusadona and Chizarira National Parks also protect Zambezi Valley mopane woodland and lowveld *Commiphora/Combretum* scrub savanna, with extensive areas of escarpment *Brachystegia* woodland in Chizarira National Park, the contiguous Chirisa Safari Area, and Matusadona National Park. The other major lowveld conservation area is Gonarezhou National Park and Malapati Safari Area in the southeast, which contains mopane savanna, *Androstachys* thickets, and riverine woodlands, and supports a diverse large mammal community. Tuli Safari Area comprises mopane and *Acacia* savanna and *Combretum* scrub woodland. Umfurudzi Safari Area in the northeast extends from low altitude *Pterocarpus/Terminalia* savanna to escarpment *Brachystegia* woodland.

Matobo (=Matopos) National Park near Bulawayo consists of boulder-strewn granite hills covered in variable types of woodland, with grassland in the valleys. Matobo includes a fenced game enclosure (65 sq km) into which a variety of antelopes and other large mammal species have been reintroduced. Some antelopes, e.g., sable, bushbuck, kudu and klipspringer occur naturally in Matobo National Park both within and outside the game enclosure.

Representative examples of highveld plateau *Brachystegia* woodland antelope communities are restricted to relatively small areas within recreational parks and sanctuaries, in most cases alongside man-made impoundments, such as McIlwaine, Kyle, Ngezi and Mushandike. Kyle Recreational Park, for example, is near the southern edge of the central plateau. It includes a 76 sq km fenced enclosure of *Brachystegia* woodland savanna on the shores of Lake Kyle (created by the Kyle Dam in 1961). Bushbuck, kudu, grey duiker, reedbuck, klipspringer and steenbok occurred naturally in the area when the dam was completed (Wilson 1970). Several other antelope species have been reintroduced successfully to the Kyle game enclosure. McIlwaine (fenced game enclosure 18 sq km) and Ngezi Recreational Parks, Mushandike Sanctuary, and some smaller protected areas not shown in Fig. 2, also contain limited natural antelope communities which have been supplemented by reintroduced species.

Examples of the submontane and montane forests, grasslands and heath-like scrub characteristic of the eastern highlands are preserved in Nyanga, Mtarazi Falls and Chimanimani National Parks. Melsetter Eland Sanctuary also includes montane grassland with patches of forest and scrub.

Zimbabwe's conservation areas play a major role in the developing tourist industry. The intensity of management is relatively high in some national parks and recreational parks, and lower in other protected areas, e.g., some safari areas lack permanently resident staff. Reduction of large mammal populations is carried out in several conservation areas to prevent serious habitat degradation (Cumming 1981, 1983). Although primarily directed at elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*) and hippopotamus (*Hippopotamus amphibius*), this has included reductions of some antelope populations, e.g., impala in Hwange, Mana Pools and Gonarezhou National Parks, waterbuck in Hwange and Mana Pools, and wildebeest in Hwange. Population reduction to prevent the buildup of excessive numbers of ungulates is also essential in several of the recreational parks, e.g., McIlwaine and Kyle. In the smaller parks, population reduction is now almost invariably by capture and translocation, mostly to farms.

Conservation Measures Proposed

Zimbabwe's system of conservation areas is probably sufficient to ensure the long-term survival of all of the country's antelope species (excluding those which occur only as occasional vagrants), providing there is adequate management of genetic resources (many protected populations within individual conservation areas have an effective population size of <500). However, the long-term existence of these conservation areas is compromised by the land requirements of the rapidly increasing human population. Schemes required for Zimbabwe's development can also pose a threat to the future of protected areas. The alluvial region of the middle Zambezi Valley conservation areas, for example, would have been flooded by a proposed hydroelectric dam at Mupata Gorge on the Zambezi River (Du Toit 1984). In this case, an alternative site has since been chosen at Batoka Gorge, between Victoria Falls and Lake Kariba, which involves lower environmental costs, but similar threats may arise in future.

Maintenance of the national parks and other conservation areas will depend on the extent to which they can contribute to the needs and improved living standards of surrounding human communities. Enhancement of the value of protected areas to the people living around them is therefore crucial to the long-term future of these areas and the plants and animals they protect. Human population densities are very low in some regions of Zimbabwe, e.g., Hwange-Matetsi and the middle Zambezi Valley, but in others human populations are expanding rapidly, e.g., on Communal Farming land adjacent to Matusadona and Chizarira National Parks and Chirisa and Chete Safari Areas in the Sebungwe region south of Lake Kariba, and Gonarezhou National Park/Malapati Safari Area.

Schemes have recently been initiated to integrate wildlife utilisation with agricultural development and other forms of land use on the Communal Farming lands surrounding conservation areas, e.g., in the Sebungwe region (Cumming 1981; Martin & Taylor 1983; Child 1984; Martin 1986). Key features include restriction of farming land to fenced areas on the better arable soils, avoidance of overstocking of domestic livestock, and establishment of buffer zones between conservation areas and farming land for controlled exploitation of surplus wildlife populations. If successful, such schemes will largely remove the conflict between wildlife and subsistence agriculture. They are planned to stimulate local people to appreciate the economic benefits of wildlife, allow various forms of wildlife utilisation such as recreational hunting and sustained-yield harvesting to contribute directly to improved living standards, and increase the land area available to wildlife, thus maintaining spatial continuity between different conservation areas and preventing them from becoming ecological islands. This approach to land development and the conservation of natural resources could provide a model for ecologically sound development which ensures the future of both human and wildlife populations in agriculturally marginal areas, both in other parts of Zimbabwe and elsewhere in Africa. Ultimately, however, limitation of human population growth will be essential to prevent habitat degradation and the elimination of natural life support systems for both man and wildlife.

In addition to the development of multiple land use policies which recognise the value of wildlife, there is a need for greater international cooperation in the management of resources shared with neighbouring countries. Improved coordination between Zimbabwe and Zambia in managing the middle Zambezi Valley is an example of such a need (Du Toit 1984).

Species Accounts

Knowledge of habitat preferences, diet and reproduction of antelopes has been summarised by Smithers & Wilson (1979) for

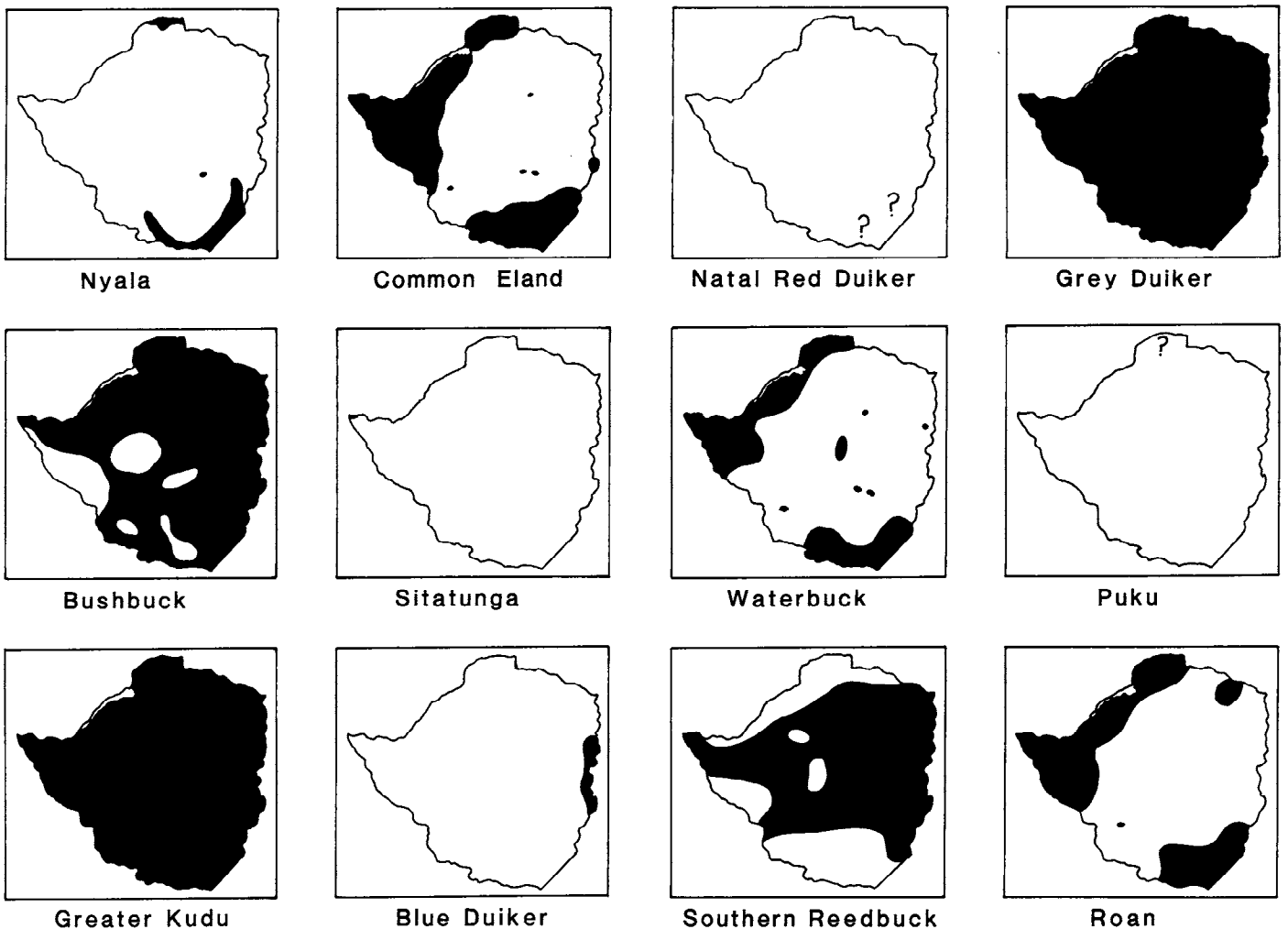

Fig. 3. Distribution of antelopes in Zimbabwe. Shaded areas represent the approximate limits of the current distribution (excluding reintroductions to commercial farming land), not the area of continuous occurrence. Based on Smithers & Wilson (1979), with additional information from Child & Savory (1964) and Smithers (1983).

Zimbabwe, and by Smithers (1983) for southern Africa in general. This account concentrates on the distribution, abundance, and conservation status of each species in Zimbabwe.

Nyala (*Tragelaphus angasii*)

Distribution & Population: Confined to two separate areas of lowveld, in the Zambezi Valley in the north, and more extensively in the Sabi/Limpopo area in the southeast (Fig. 3). Introduced into Kyle Recreational Park outside its natural range. The total population numbers at least in the thousands.

Status: Rare.

Conservation Measures Taken: Well represented in Gonarezhou National Park, where it is locally common (population about 1000). Uncommon and local in several of the middle Zambezi Valley conservation areas (Mana Pools National Park, Sapi and Chewore Safari Areas), and in Kyle Recreational Park.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Formerly widespread, but eliminated from most of the highveld plateau by the spread of settlement; reintroduced to some commercial farms and conservation areas. Now confined mainly to the west, the middle Zambezi Valley in the north, the southeastern lowveld, and a small area in the eastern highlands (Fig. 3). Scarce and patchily distributed throughout much of its remaining range in Zimbabwe. The total population may not exceed a few thousand.

Status: Satisfactory (not threatened). Occurs in reasonable numbers in the major parks such as Hwange and the Zambezi Valley, and on farms in the southeast. Populations are probably stable or increasing in conservation areas and on some commercial farms, but declining in Communal Farming areas.

Conservation Measures Taken: Occurs in most conservation areas, but often in small numbers. The largest protected population (about 1600) is in Hwange National Park, where it is uncommon but widespread. It is also uncommon in Kazuma Pan, Chizarira, Matusadona and Gonarezhou National Parks, and Matetsi, Chete, Dande and Doma Safari Areas. Rare in Mana Pools National Park and Deka, Chirisa, Charara, Urungwe, Sapi, and Chewore Safari Areas. Common in Tuli Safari Area and in several small conservation areas into which it has been reintroduced: Matobo National Park, McIlwaine and Kyle Recreational Parks, and Mushandike Sanctuary (where there is a domesticated eland herd); none of these populations exceeds the low hundreds. In the eastern highlands, eland survive in Chimanimani National Park (uncommon and local), and Melsetter Eland Sanctuary. The latter area was established as a refuge for some of the eland which were damaging young trees in nearby pine plantations.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Widely distributed in riverine forest and thicket, occurring along most small streams and rivers with adequate cover on their banks. Absent from extensive parts of the more arid west and highveld plateau which lack suitable habitat (Fig. 3), although there is evidence that this species is expanding its range. It now occurs in many places where it did not occur 15 years ago, e.g., on several tributaries of the Umzingwane River near Bulawayo, and in the Main Camp area in the

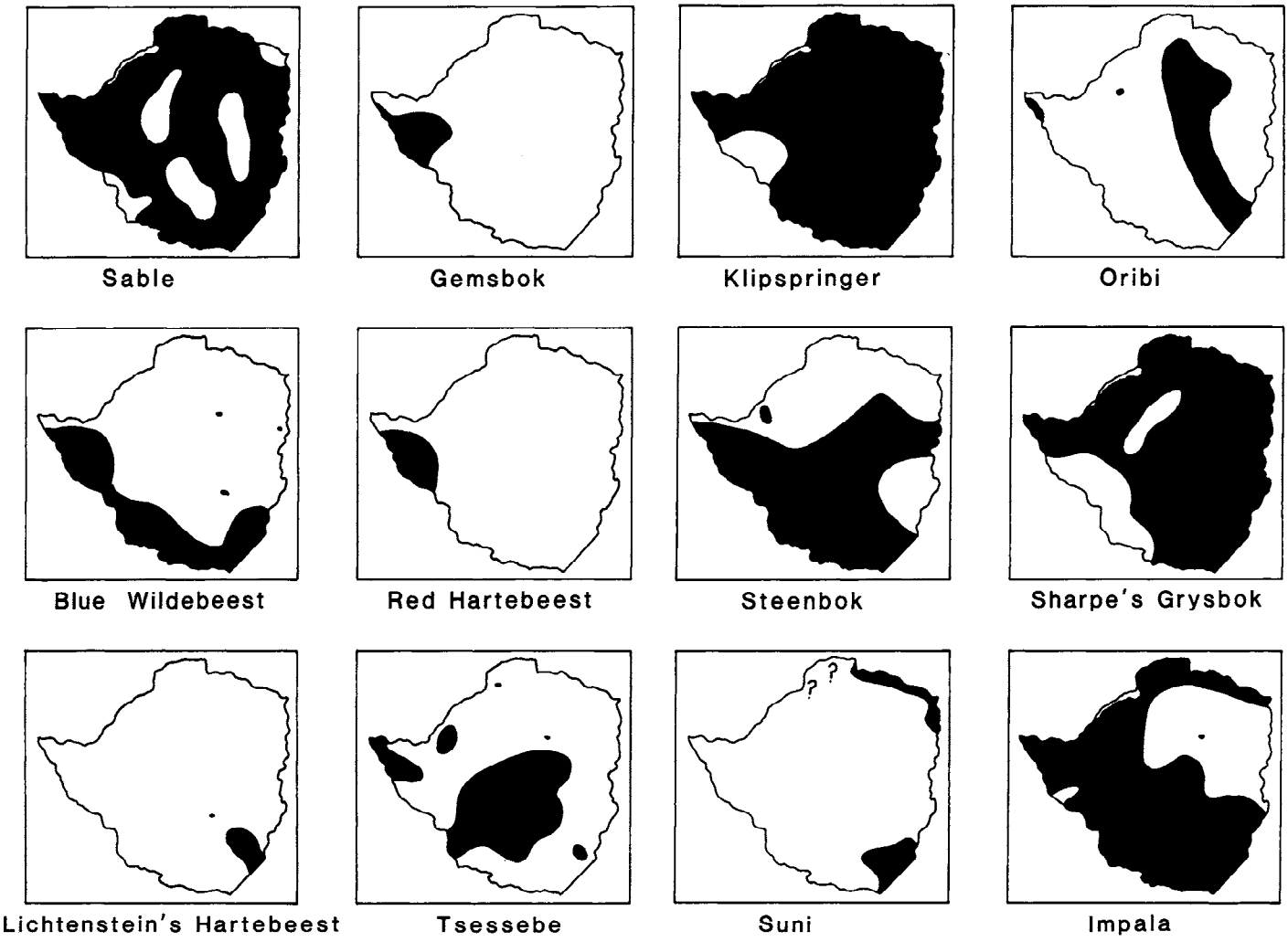

Fig. 3. Distribution of antelopes in Zimbabwe—continued.

northeast of Hwange National Park. Numbers unknown, but locally common in many areas.

Status: Satisfactory. Still occurs over much of its range in Zimbabwe and often persists close to human settlement.

Conservation Measures Taken: Occurs in most conservation areas with suitable habitat. Uncommon and local in Hwange National Park, where it is confined to riverine vegetation in the north (Wilson 1975), Zambezi, Victoria Falls, Matusadona, Nyanga, Chimanimani and Matobo National Parks, and Tuli Safari Area. Locally common in Chizarira, Mana Pools and Gonarezhou National Parks, Kyle Recreational Park, and Chete, Chirisa, Charara, Urungwe and Malapati Safari Areas. Widespread and common in Sapi, Chewore, Dande and Umfurudzi Safari Areas, and Ngezi Recreational Park. Very common in Doma Safari Area.

Sitatunga (*Tragelaphus spekii*)

Distribution, Population & Status: Occurs on islands in the Zambezi River and occasionally on the south bank of the Zambezi in the extreme northwest (Fig. 3). This is the only part of the Zimbabwe section of the Zambezi Valley with suitable habitat for sitatunga of swamps and extensive *Phragmites* reedbeds. The species occurs more widely in the adjacent Caprivi Strip (Namibia) between Zambia and Botswana.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Occurs throughout, although its occurrence is often patchy and localised within its overall range (Fig. 3). Numbers unknown, but common in many areas.

Status: Satisfactory. Has withstood the advance of settlement better than any other species of large antelope. In developed areas the kudu is largely nocturnal, retreating into thick cover during the day (Fraser 1958).

Conservation Measures Taken: Occurs in almost all conservation areas. Very common throughout Hwange National Park (Wilson 1975), where the population is about 10 000. Also very common in Matobo National Park, Chirisa, Charara and Sapi Safari Areas. Widespread and common in Zambezi, Chizarira, Matusadona, Mana Pools and Gonarezhou National Parks, Kyle Recreational Park, Mushandike Sanctuary, and Matetsi, Deka, Chete, Urungwe, Chewore, Dande, Malapati and Tuli Safari Areas. Locally common in Nyanga National Park. Uncommon in Doma Safari Area, McIlwaine and Ngezi Recreational Parks. The population in Kyle Recreational Park reached about 300 in the late 1960s, in excess of the park's carrying capacity, and was subsequently reduced to about 200 by a combination of culling and heavy natural mortality (Wilson 1970).

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Confined to evergreen forests in the eastern highlands (Fig. 3). Numbers unknown, but scarce in most of its range. The largest surviving population in Zimbabwe (perhaps 100 animals or more) is in Chirinda Forest on Mount Selinda at the southern end of the eastern highlands.

Status: Indeterminate. Populations are probably declining in most places because of poaching with snares and nets, but it is not clear to what extent this threatens the species' survival in Zimbabwe.

Conservation Measures Taken: Occurs in forest patches within Chimanimani National Park (present in fair numbers but not common), Mtarazi Falls National Park (common in the thick

evergreen forests below the falls, but heavily poached by the local people), Nyanga National Park (occasionally seen in small forest patches; may be quite common), and Melsetter Sanctuary (rare). Also occurs in a few very small reserves not shown in Fig. 2, e.g., Vumba Botanical Garden (near Mutare) which comprises 0.4 sq km of natural moist montane forest with a developed area for exotic trees and shrubs.

Conservation Measures Proposed: More effective control of poaching within and outside conservation areas in the eastern highlands may be necessary to ensure this duiker's long-term survival.

Natal Red Duiker (*Cephalophus natalensis*)

Distribution, Population & Status: This duiker has not been recorded definitely from Zimbabwe, but there are persistent visual reports of its occurrence in the southeast (Smithers & Wilson 1979). It may occur within Zimbabwe limits in *Androstachys* thickets or other suitable habitat in the Sabi and Limpopo Valleys (Fig. 3). If it does occur in Zimbabwe, it is undoubtedly rare and localised.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Still occupies almost all of its range throughout the country (Fig. 3). Numbers unknown, but common in many localities.

Status: Satisfactory. Shows a remarkable ability to survive even in intensively developed areas (Smithers & Wilson 1979).

Conservation Measures Taken: Occurs in all of the conservation areas shown in Fig. 2. Common in some protected areas, e.g., Matobo, Gonarezhou and Chizarira National Parks. Patchily distributed and rarely seen by day in Hwange National Park, where it is nevertheless locally common (Wilson 1975).

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: Largely eliminated from the highveld plateau, and occurs mainly in the west, Zambezi Valley, and southeastern lowveld (Fig. 3). The total population numbers well into the thousands.

Status: Satisfactory. Well represented in conservation areas.

Conservation Measures Taken: Occurs locally in Hwange National Park (common in the north; total population about 800). Very common locally in Zambezi and Mana Pools National Parks. Common in restricted areas of suitable habitat within Matusadona National Park, and Matetsi, Chirisa, Charara, and Urungwe Safari Areas. Uncommon in Chizarira, Nyanga and Gonarezhou National Parks, and Chete, Chewore and Dande Safari Areas. Rare in Deka Safari Area. Reintroduced into Matobo National Park (locally common), McIlwaine and Kyle Recreational Parks, and Mushandike Sanctuary. Some reintroduced populations have increased to relatively high densities, e.g., Tomlinson (1981) reported an overall density of 4.8 waterbuck per sq km in the 18 sq km game enclosure in McIlwaine Recreational Park.

Puku (*Kobus vardoni*)

Distribution, Population & Status: A rare vagrant in the Mana Pools/Chewore area. Not known to occur in a permanently resident breeding population in Zimbabwe, but a single female was observed recently in Mana Pools National Park (Dunham & Tsindi 1984), and a second animal has also been seen. The nearest known puku population to the middle Zambezi Valley is in the Luangwa Valley in Zambia, where the species is very common on the riverine grasslands. Recent observations in Malawi suggest that adult female puku may undertake considerable dispersal movements (see chapter 5).

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Formerly widespread, but absent from the Zambezi Valley, parts of the west, and most of the southern lowveld. Naturally occurring populations have persisted on the highveld to a greater degree than most larger antelopes, although the occurrence of reedbuck is very localised within its overall distribution (Fig. 3). Numbers unknown, but locally common in suitable habitat such as open grassland with cover of tall grass or reeds.

Status: Satisfactory.

Conservation Measures Taken: Has a very localised distribution in Hwange National Park (population about 250), where it is common within localized areas of open grassland and reed beds (Wilson 1975). Similarly localised but common within suitable habitat in Zambezi and Matobo National Parks and Matetsi Safari Area. Very common locally on the Sengwa alluvial terraces (densities >5 per sq km) in Chirisa Safari Area. Common in several of the small highveld conservation areas, e.g., Kyle, McIlwaine and Ngezi Recreational Parks. The Kyle population increased to unnaturally high levels for the available habitat (>600 animals) in the late 1960s, then crashed to about 60 survivors because of malnutrition and the effects of an unseasonal cold snap at the height of the hot dry season (Ferrar & Kerr 1971). This population subsequently recovered and is now maintained in the low hundreds. Reedbuck also occur in Mushandike Sanctuary and Nyanga National Park (uncommon).

Roan (*Hippotragus equinus*)

Distribution & Population: Formerly widespread in moderate to low numbers, but largely eliminated from the highveld plateau and now occurs mainly in the west, southeast, northeast, and in scattered areas of the Zambezi Valley (Fig. 3). Best et al. (1970) estimated that the roan population was >350 in Wankie (now Hwange) National Park, with about 750–800 elsewhere in the country, including approximately 280 on other national parks and wildlife land, 80 on forestry land, 200 on commercial farming land, and 200 in Communal Farming areas. Since then the species has barely held its own. The total population remains <2000.

Status: Vulnerable. Its long-term survival in Zimbabwe will depend on the maintenance of effective protection within conservation areas.

Conservation Measures Taken: The major stronghold of roan in Zimbabwe is Hwange National Park, where it is widespread but uncommon (total population about 600–900). It also occurs widely at low densities within Kazuma Pan National Park and Chewore Safari Area, and is uncommon and local in Matusadona and Matobo (reintroduced) National Parks and Dande Safari Area. Rare in Chizarira, Mana Pools and Gonarezhou National Parks, and Matetsi, Chirisa, Charara, Urungwe and Sapi Safari Areas. May still occur in low numbers in a few other conservation areas, e.g., Zambezi National Park, Chete and Doma Safari Areas. Apart from Hwange National Park, all of these protected roan populations are very small, e.g., about 20 in Chizarira, <50 in Matusadona, and 30 in Gonarezhou (Best et al. 1970).

Sable (*Hippotragus niger*)

Distribution & Population: Formerly throughout; eliminated from some areas, especially on the highveld plateau, but still occurs widely (Fig. 3). The total population is about 14 000.

Status: Satisfactory.

Conservation Measures Taken: Its major Zimbabwean stronghold is in the west, where it is widespread and very common within Matetsi Safari Area, and common in Hwange (population about 2700), Zambezi and Kazuma Pan National Parks. Also common in Matobo National Park (Grobler 1974), and in McIlwaine, Ngezi and Kyle Recreational Parks, and Mushandike Sanctuary (reintroduced into the latter four areas). Occurs at lower densities in the Sebungwe and middle Zambezi Valley conservation areas: uncommon in Chizarira and Matusadona National Parks, and Chete, Chirisa, Charara, Dande and Doma Safari Areas;

rare in Mana Pools National Park, Urungwe and Chewore Safari Areas; absent from Sapi Safari Area. Uncommon and localised in Gonarezhou National Park. Occurs in small numbers in Nyanga (recently reintroduced) and Chimanimani National Parks. While large protected populations (>1000 individuals) are confined to Hwange National Park and Matetsi Safari Area, several others number in the hundreds, e.g., in Zambezi and Matobo National Parks, Ngezi Recreational Park, and Mushandike Sanctuary.

Gemsbok (*Oryx gazella gazella*)

Distribution & Population: Confined to Hwange National Park and adjacent areas in the west near the Botswana border, where it occurs mainly on Kalahari sand (Fig. 3). Numbers do not exceed a few hundred.

Status: Rare. The small Zimbabwe population occurs at the northeastern limit of the species' southern African range, and is almost entirely restricted to national parks and wildlife estate, and forestry land.

Conservation Measures Taken: Widespread but rarely seen in Hwange National Park (Wilson 1975), where the population is <200. Also occurs in Kazuma Pan National Park, where it is uncommon.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: Found mainly in the west and the southern lowveld (Fig. 3). Archaeological evidence indicates that this species once occurred on the highveld plateau. Often common where it occurs. The total population comprises several thousand individuals.

Status: Satisfactory.

Conservation Measures Taken: Common in the north and northeast of Hwange National Park (Wilson 1975), where the population is about 2000, and in Tuli Safari Area. Also common in Matobo National Park, and McIlwaine and Kyle Recreational Parks; in each of these areas the species has been reintroduced and the population has increased to >100. Uncommon and localised in Matetsi Safari Area, Nyanga National Park (introduced), and Gonarezhou National Park.

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution, Population & Status: Vagrants of *A. b. caama* occasionally move into western Zimbabwe from Botswana (Fig. 3). Small groups may sometimes remain for up to a few years (Smithers & Wilson 1979). Occasional wanderers have been observed in Hwange National Park (Wilson 1975) and Kazuma Pan National Park.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Population: This hartebeest has apparently been uncommon and localised in Zimbabwe since before the advent of European settlement (Smithers & Wilson 1979). It is confined to part of the southeastern lowveld and Mushandike Sanctuary (recently introduced) (Fig. 3). The population is very small and probably does not exceed 100–150. Information on this species' herd structure, territorial behaviour and reproduction was reviewed by Booth (1985).

Status: The survival of this species in Zimbabwe is precarious, and its status is endangered. Numbers were reported to have declined considerably during the 1950s (Fraser 1958). By 1969 it was restricted largely to a few private ranches in the southeast, with a total population of about 150. A further survey of the same areas in 1976 revealed only 90 individuals (summary given in Smithers & Wilson 1979). Since then it has been introduced into two conservation areas, but the total population remains very small.

Conservation Measures Taken: In 1972 the Department of National Parks and Wild Life Management introduced 70 Lichtenstein's hartebeest into Gonarezhou National Park. This population expanded to >100 animals, but has declined over the last few years and is now <60. A small number has recently been introduced into Mushandike Sanctuary in an attempt to establish a second population on parks and wildlife land.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Occurs locally on parts of the highveld plateau, and in the south, southeast and northwest (Fig. 3). In 1972 the total population was about 2500, mainly on cattle ranches in the commercial farming areas. Since then, tsessebe numbers have increased considerably both within and outside conservation areas.

Status: Satisfactory. Successful conservation of this species, especially by private landholders, has allowed the main populations on commercial farming land to increase to the level where sustained use is necessary to ensure their continued increase and further expansion of the species' range.

Conservation Measures Taken: Locally common in Kazuma Pan National Park; uncommon in the northern part of Hwange National Park (population about 100). Well represented in Chizarira National Park (population about 300), and occurs rarely in Chirisa Safari Area. Reintroduced into Urungwe Safari Area. Reintroduced populations have become well established in Matobo National Park, McIlwaine and Kyle Recreational Parks. Also occurs in Mushandike Sanctuary (uncommon).

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Widespread, but confined to localised areas of suitable rocky outcrops and hillsides within its overall range (Fig. 3). Numbers unknown, but locally common in its preferred habitat, e.g., on parts of the Zambezi Valley escarpment and in areas of granite hills such as the Matopos.

Status: Satisfactory.

Conservation Measures Taken: Common in Matobo National Park, which contains an extensive area of suitable habitat (population >1000). Occurs in most other conservation areas, within restricted areas of rocky terrain, e.g., Hwange (northern sector only), Chizarira, Matusadona and Chimanimani National Parks, McIlwaine and Kyle Recreational Parks, and Chete, Chirisa, Charara, Urungwe, Chewore, Dande, Doma and Umfurudzi Safari Areas. Rare in Mana Pools and Gonarezhou National Parks.

Oribi (*Ourebia ourebi*)

Distribution & Population: Occurs locally on the highveld plateau, in the southeastern lowveld, and in the northwest (Fig. 3), mainly in commercial farming areas. Population unknown, but does not occur in large numbers.

Status: Vulnerable. Not very well represented in conservation areas. Effective protection on commercial farms is important for its long-term survival.

Conservation Measures Taken: Commonly seen in Kazuma Pan National Park, but the population is not large (about 20–25 individuals in the early 1970s, Wilson 1975). Locally distributed and uncommon in a few other conservation areas, e.g., Gonarezhou National Park, Kyle Recreational Park, and Doma Safari Area. Rare in Chizarira National Park.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Widespread on the highveld plateau, southern lowveld, and in the west (Fig. 3). Numbers unknown, but locally common.

Status: Satisfactory. Remains widespread on commercial farming land, especially where afforded some protection by landholders, and well represented in conservation areas.

Conservation Measures Taken: Widespread and common in Hwange, Kazuma Pan, Zambezi, Matobo and Gonarezhou Na-

tional Parks, and Matetsi, Deka, Malapati and Tuli Safari Areas. Uncommon in Nyanga National Park, Kyle Recreational Park, and Mushandike Sanctuary.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Widespread except in the dry western regions (Fig. 3). Numbers unknown. Not often seen because of its secretive habits, but commoner than generally supposed in suitable habitat, e.g., in areas of thick cover at the base of rocky outcrops. Grysbok appear to be increasing in number and expanding their range in some areas, e.g., in the Bulawayo region, where archaeological remains from the Matopos Hills indicate that this species was very common 40 000 years ago, and in the Main Camp area of Hwange National Park.

Status: Satisfactory.

Conservation Measures Taken: Present in most conservation areas, e.g., occurs widely in Zambezi, Chizarira, Matusadona, Mana Pools, Gonarezhou and Matobo National Parks, and Chete, Chirisa, Charara, Urungwe, Sapi, Chewore, Dande, Doma, Umfurudzi and Malapati Safari Areas. Confined to the northern part of Hwange National Park, where it is locally common (Wilson 1975). Uncommon and local in Mushandike Sanctuary.

Suni (*Neotragus moschatus*)

Distribution & Population: Occurs in two discrete regions: narrowly in the northeast, and in the southeastern lowveld (Fig. 3). The northern population may extend westwards into the middle Zambezi Valley; the species has been recorded from Urungwe (Smithers & Wilson 1979). Numbers unknown, but generally scarce.

Status: Rare.

Conservation Measures Taken: Locally common within restricted areas of suitable dry thicket habitat in Gonarezhou National Park and Malapati Safari Area. Suni may also occur in some of the middle Zambezi Valley conservation areas, e.g., Urungwe Safari Area and Mana Pools National Park.

Impala (*Aepyceros melampus*)

Distribution & Population: Occurs widely, but absent from most of the plateau *Brachystegia* woodlands (Fig. 3). Locally abundant in the southeastern lowveld, the northwest, and the Zambezi Valley. Probably the most numerous species of medium to large-sized antelope in the country, with a total population of at least many tens of thousands.

Status: Satisfactory.

Conservation Measures Taken: Well represented in conservation areas. Very common in the northern part of Hwange National Park and extending its range southward (Wilson 1975). Locally very common in Matusadona National Park, Urungwe and Sapi Safari Areas. Widespread and very common in Mana Pools and Gonarezhou National Parks, and Chirisa and Malapati Safari Areas. Abundant throughout Tuli Safari Area. Widespread and common in Matetsi and Chewore Safari Areas. Common within more restricted areas of Zambezi and Chizarira National Parks, and Deka, Chete, Charara, and Dande Safari Areas. Reintroduced to Matobo National Park, McIlwaine, Ngezi and Kyle Recreational Parks. These reintroduced populations increased rapidly and impala are now regularly culled/removed (as in some of the larger conservation areas) to prevent overpopulation and habitat degradation. Recently reintroduced to Umfurudzi Safari Area.

Impala is the most numerous antelope species in many of Zimbabwe's protected areas. Very large populations (10 000 or more) occur in Hwange National Park and in Mana Pools National Park together with the contiguous middle Zambezi Valley safari areas. Populations reach the thousands in other conservation areas of substantial size, such as Gonarezhou and Chizarira/Chirisa, and number in the hundreds in some of the smaller protected areas, e.g., Zambezi and Matobo National Parks, Kyle Recreational Park and Tuli Safari Area.

References

Anonymous. 1985. Black rhino poacher crackdown in Zimbabwe. *IUCN Bulletin 16*(7–9): 94.

Best, E.B.; Palmer, A.W.; Shephard, T.; Wilson, V.J. 1970. Some notes on the present day status of roan *Hippotragus equinus,* in Rhodesia. *Arnoldia 5*(2): 1–11.

Booth, V.R. 1985. Some notes on Lichtenstein's hartebeest, *Alcelaphus lichtensteini* (Peters). *South African Journal of Zoology 20:* 57–60.

Child, G.F.T. 1984. Managing wildlife for people in Zimbabwe. *In* McNeely, J.A.; Miller, K.R. (Editors). National parks, conservation and development: the role of protected areas in sustaining society. IUCN/Smithsonian Institution.

Child, G.; Savory, C.R. 1964. The distribution of large mammal species in Southern Rhodesia. *Arnoldia 1*(14): 1–15.

Cumming, D.H.M. 1981. The management of elephant and other large mammals in Zimbabwe. *In* Jewell, P.A.; Holt, S. (Editors). Problems in management of locally abundant wild mammals, pp. 91–117. New York, Academic Press.

Cumming, D.H.M. 1983. The decision-making framework with regard to the culling of large mammals in Zimbabwe. *In* Owen-Smith, R.N. (Editor). Management of large mammals in African conservation areas, pp. 173–186. Pretoria, Haum.

Dunham, K.M.; Tsindi, N. 1984. Record of the puku (*Kobus vardoni*) from Zimbabwe. *Zimbabwe Science News 8*(3/4): 35.

Du Toit, R.F. 1984. Some environmental aspects of proposed hydroelectric schemes on the Zambezi River, Zimbabwe. *Biological Conservation 28:* 73–87.

Ferrar, A.A.; Kerr, M.A. 1971. A population crash of the reedbuck *Redunca arundinum* (Boddaert) in Kyle National Park, Rhodesia. *Arnoldia 16*(5): 1–19.

Fraser, A.D. 1958. On the present day status of ungulates in Southern Rhodesia. *Mammalia 22:* 469–475.

Grobler, J.H. 1974. Aspects of the biology, population ecology and behaviour of the sable *Hippotragus niger niger* (Harris, 1838) in the Rhodes Matopos National Park, Rhodesia. *Arnoldia 7*(6): 1–36.

MacKinnon, J.; MacKinnon, K. 1986. Review of the protected areas system in the Afrotropical realm. Gland and Cambridge, IUCN.

Martin, R.B. 1986. Communal area management plan for indigenous resources (Project CAMPFIRE). *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 279–295. Washington DC, US Peace Corps.

Martin, R.B.; Taylor, R.D. 1983. Wildlife conservation in a regional land use context: the Sebungwe region of Zimbabwe. *In* Owen-Smith, R.N. (Editor). Management of large mammals in African conservation areas, pp. 249–270. Pretoria, Haum.

Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.

Smithers, R.H.N.; Wilson, V.J. 1979. Check list and atlas of the mammals of Zimbabwe Rhodesia. *National Museums & Monuments of Zimbabwe Rhodesia Museum Memoir No. 9.*

Tomlinson, D.N.S. 1981. Effects of the social organisation of waterbuck *Kobus ellipsiprymnus ellipsiprymnus* (Ogilby 1833) on forage-habitat utilisation in a Rhodesian game park. *African Journal of Ecology 19:* 327–339.

Western, D.; Vigne, L. 1985. The deteriorating status of African rhinos. *Oryx 19:* 215–220.

Wilson, V.J. 1970. Data from the culling of kudu, *Tragelaphus strepsiceros* Pallas in the Kyle National Park, Rhodesia. *Arnoldia 4*(36): 1–26.

Wilson, V.J. 1975. Mammals of the Wankie National Park, Rhodesia. *National Museums & Monuments of Rhodesia Museum Memoir No. 5.*

Chapter 10: South Africa

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Introduction

The Republic of South Africa comprises an extensive interior plateau, which occupies about three-quarters of the country's total area, and a morphologically diverse marginal zone. The most prominent relief feature is the Great Escarpment, which forms the western, southern and eastern edge of the interior plateau. The Escarpment varies in height and continuity, from the relatively low and easily traversed Namaqualand highlands in the west, to the spectacular Drakensberg which rises to over 3000 m at its highest point on the Natal/Lesotho boundary. The interior plateau is largely between 900 m and 1650 m in elevation.

Average rainfall increases from west to east, varying from <125 mm per year along the arid west coast to >1000 mm per year on the east coast. The southwestern corner of the country receives winter rainfall, with an all-year-round rainfall area on the southern coast, and a summer rainfall area over the remainder of the country.

The great variety of climate and topography has produced a wide range of natural habitats. The major natural vegetation zones (most now greatly modified by agricultural development) are outlined in Fig. 1. The northwestern coastal desert is the southern portion of the Namib. The coastal plains, folded mountain ranges and valleys of the winter rainfall area in the southwest and the southern coast support a unique macchia vegetation (Cape fynbos), which is regarded as a distinct floral kingdom. Typical fynbos consists of a diverse community of drought-tolerant shrubs, from tall proteas to smaller heath-like forms. In the southern coastal region, fynbos occurs alongside forest dominated by trees such as *Podocarpus* spp., *Olea capensis* and *Calodendron capense*, which extends from the lower slopes of the mountains almost to the sea.

On its northern edge, the Cape fynbos gradually transforms into the typical vegetation of the Karoo, which is an extensive, largely flat, arid area with scattered low shrubs such as *Pentzia* spp. and *Rhigozum trichotomum* and very few trees except for acacias (*Acacia karroo*) along the larger river valleys. On its eastern border, the Karoo merges into the highveld of the central inland plateau. The highveld (altitude >1200 m) is largely flat to gently undulating and comprises open grassland dominated by species such as *Themeda triandra* (sweetveld), and *Hyparrhenia* spp. and *Cymbopogon* spp. (sourveld), with few trees.

The highveld is bordered on the northwest by the *Acacia* thornveld of the southern Kalahari. On its northern edge, the highveld merges into the lower altitude savanna of the bushveld. The northeastern lowveld (altitude generally <600 m) comprises savanna, bushland and woodland, with typical tree species including *Acacia* spp., *Combretum* spp. and *Colophospermum mopane*.

Below the eastern escarpment, open grassland now covers most of the rolling country of the eastern midlands (altitude 800–1700 m). This region formerly supported extensive patches of forest in the heads of valleys and a considerable amount of *Acacia* bush at lower altitudes. The humid subtropical zone of the eastern coastal lowlands was originally covered by a forest-savanna mosaic, but much of it is now densely settled.

Man has had a major impact on South Africa's wildlife for more than 300 years. Hunting reduced and in some cases eliminated the large mammals of the Cape during the late 17th and 18th centuries. There were similar negative impacts on the wildlife of the interior as this was penetrated by the trekboere, for many of whom wild game was an important source of food and income. The influence of these migrant farmers eventually extended to what are now the provinces of the Orange Free State and the Transvaal (Fig. 2) and beyond. In some areas, hunting by African tribes had a destructive effect on wildlife populations before the first white settlers arrived.

The destruction of wildlife by hunting and agricultural pressures was eventually countered by the enforcement of hunting regulations and the establishment of conservation areas. The gazetting of the Sabie and Shingwedzi Game Reserves in the lowveld of the eastern Transvaal in 1902–03, and the subsequent development of this area into the Kruger National Park (proclaimed in 1926) marked major turning points in the history of South Africa's wildlife. Today, antelopes and other large mammals are generally well represented in an extensive network of effectively protected and managed conservation areas. In addition, populations of many species have been established on private farmland for aesthetic and/or economic reasons. Most of the larger antelopes are probably more numerous in South Africa in the 1980s than at any other time during this century.

Current Status of Antelopes

The variety of South Africa's natural habitats is reflected in the diversity of its antelope fauna, which comprises 29 species (Table 1; bontebok and blesbok are treated as conspecific). This includes five species which are endemic to South Africa and the two independent countries which it surrounds, Lesotho and Swaziland (Fig. 2), viz., grey rhebok, bluebuck, black wildebeest, bontebok/blesbok, and Cape grysbok.

A few species formerly occurred in suitable habitat throughout the country, e.g., eland, grey duiker and steenbok, but most of the major vegetation zones (Fig. 1) had distinctive antelope communities. Characteristic antelopes of the southwestern fynbos zone included bontebok, red hartebeest, the extinct bluebuck, eland, Cape grysbok, steenbok, klipspringer and grey rhebok, with bushbuck and blue duiker in the forests of the southern coast. The Karoo was formerly inhabited by large herds of black wildebeest, red hartebeest, springbok, gemsbok and eland, with grey duiker and steenbok widespread. A similar antelope fauna occurred in the Kalahari thornveld, but with blue wildebeest replacing black wildebeest.

The highveld supported enormous populations of black wildebeest, red hartebeest, blesbok and springbok, with associated grazers such as the extinct quagga (*Equus quagga*). Some of these vast herds probably migrated seasonally between the highveld and the Karoo. Smaller antelopes of the highveld included grey duiker, steenbok, grey rhebok and southern reedbuck. The characteristic antelopes of the bushveld and lowveld included blue wildebeest, tsessebe, klipspringer, steenbok, impala, roan, sable, bushbuck, kudu, southern reedbuck, mountain reedbuck and/or waterbuck.

Typical highveld species such as black wildebeest, red hartebeest, blesbok, eland, southern reedbuck and grey rhebok occurred in the grasslands of the Drakensberg, extending into the eastern midlands, with mountain reedbuck on exposed uplands

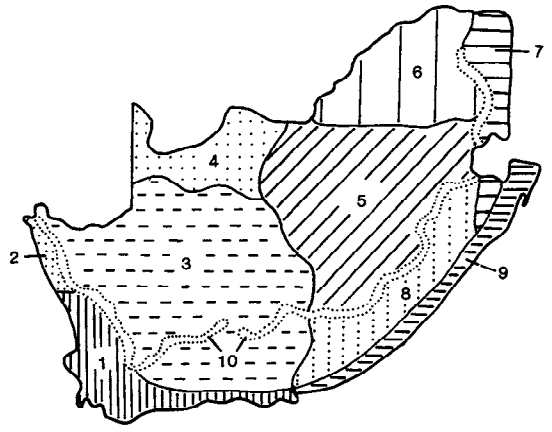

Fig. 1. Simplified outline of the approximate major natural vegetation zones of South Africa. 1: Cape fynbos and temperate forest. 2: Coastal desert. 3: Karoo. 4: Kalahari thornveld. 5: Highveld. 6: Bushveld. 7: Lowveld. 8: Eastern midlands. 9: Humid subtropical. 10: Escarpment.

and klipspringer on rocky slopes and outcrops. The humid subtropical zone along the eastern coast supported a distinctive antelope fauna, including bushbuck, blue, red, and grey duikers in the forests and thickets, with suni, blue wildebeest, nyala, impala and waterbuck in the northern part of this zone.

Almost all of these antelope communities have been reduced to scattered remnants by excessive hunting in the past and loss of habitat to agricultural development, but the bluebuck is the only antelope species which has been exterminated. Remnants of all of the country's major natural antelope communities are preserved within conservation areas, and the current status of antelopes is generally satisfactory (Table 1).

The expanding game farming industry has resulted in a marked increase in antelope populations on private farmland over the last two decades. Game is farmed either alone or, more often, in conjunction with domestic livestock, including game meat production, trading live game animals, recreational hunting and tourism (game-viewing). The most numerous antelope species on

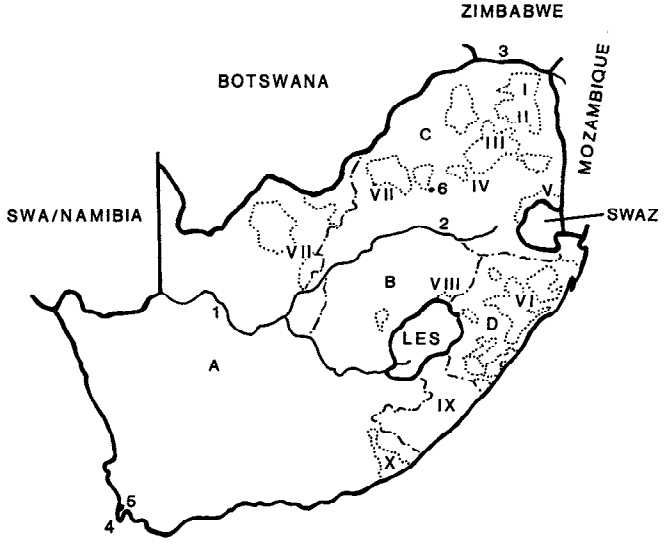

Fig. 2. Neighbouring countries and political divisions of the Republic of South Africa. LES: Lesotho. SWAZ: Swaziland. Provinces—A: Cape Province. B: Orange Free State. C: Transvaal. D: Natal. Black States (boundaries shown as dotted outlines)—I: Venda. II: Gazankulu. III: Lebowa. IV: South Ndebele. V: Swazi. VI: KwaZulu. VII: Bophuthatswana. VIII: Qwaqwa. IX: Transkei. X: Ciskei. Other areas—1: Orange River. 2: Vaal River. 3: Limpopo River. 4: Cape of Good Hope. 5: Cape Town. 6: Pretoria.

Table 1
Current Status of Antelopes in South Africa

Species	Status*	Species	Status
Bushbuck	S	Red Hartebeest	S
Nyala	S	Lichtenstein's Hartebeest	R
Greater Kudu	S	Bontebok	R
Common Eland	S	Blesbok	S
Blue Duiker	S	Tsessebe	R
Natal Red Duiker	S	Klipspringer	S
Grey Duiker	S	Oribi	V
Waterbuck	S	Steenbok	S
Southern Reedbuck	S	Cape Grysbok	S
Mountain Reedbuck	S	Sharpe's Grysbok	S
Bluebuck	Ex	Suni	V
Roan	R	Impala	S
Sable	R	Springbok	S
Gemsbok	S	Grey Rhebok	S
Black Wildebeest	S		
Blue Wildebeest	S		

* Ex = extinct; R = rare; V = vulnerable; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

farmland are springbok (Orange Free State and Cape Province), blesbok (Orange Free State, Transvaal and northern Cape), impala (Transvaal and Natal), and kudu (Transvaal and eastern Cape). Other species which have been established in substantial numbers on farms include gemsbok, black wildebeest, blue wildebeest, red hartebeest and nyala. Rare species such as sable are highly sought after and very high prices have been paid at game auctions. Some of the smaller antelopes, e.g., grey duiker and steenbok, occur naturally on extensive areas of private land. Natural populations of some other species have also survived in spite of expanding agriculture, e.g., kudu and impala in the Transvaal.

Game farming is a major positive force for maintaining and increasing antelope numbers, but it also has some detrimental aspects for conservation, such as the extensive introduction of many species to private land outside their natural ranges, and cross-breeding of related species such as blue and black wildebeest. Provincial and national conservation authorities now discourage these practices, to minimize or prevent both unnatural genetic mixing and the spread of livestock diseases.

Conservation Measures Taken

The history of wildlife conservation in South Africa since the first legal restrictions on hunting were initiated more than 300 years ago was reviewed by Bothma & Rabie (1983). In addition to effective regulation and control of hunting, protection of representative examples of the country's natural habitats within conservation areas has played a vital role in the development of effective wildlife conservation. The National Parks Board administers 14 national parks, 12 of which are important for antelope conservation. Provincial nature reserves are controlled by the Transvaal Nature Conservation Division, the Orange Free State Branch of Nature Conservation, the Cape Department of Nature and Environmental Conservation, and the Natal Parks Board. There are also numerous nature reserves under the control of local authorities, the Forestry Branch of the Department of Environmental Affairs, or privately owned, many of which have significant antelope populations. Considerable conservation progress has been made in the Black States (Fig. 2), where notable examples of conservation areas for antelopes are Bophuthatswana's Pilanesberg National Park, Lebowa's Potlake Nature Reserve, Venda's Nwanedi National Park, Transkei's Dwesa Nature Reserve, Ciskei's Tsolwana Game Park, the Tembe Elephant Reserve declared by the KwaZulu Government in Maputaland,

and three new national parks currently being established in the Swazi homeland of KaNgwane.

This extensive network of protected areas includes two very large national parks: Kruger (>19 400 sq km), which protects a major lowveld antelope community, and Kalahari Gemsbok (>9500 sq km), which protects an important example of the wildlife of the southern Kalahari thornveld. Despite their size and the presence of substantial communities of large carnivores, neither of these two parks represents a self-contained ecosystem. The boundary of Kruger National Park is completely fenced. An ecosystem-orientated approach to management has played a major part in this park's development to its pre-eminent status as an internationally famous conservation area catering to >0.5 million visitors per annum. The guiding principle to the management of Kruger National Park is maintenance of the natural structural and species diversity of the area (Joubert 1986a). This is attained by the three main management approaches of provision of artificial watering points, manipulation of animal populations, and controlled veldburning. Although Kruger National Park is of major importance for the conservation of antelopes, it is unfortunately not possible to translocate any ungulates from Kruger to other parts of the country because it is an endemic foot-and-mouth disease area.

Kalahari Gemsbok National Park is fenced on its western and southern boundaries but not on the international South Africa/Botswana border which forms its eastern boundary. This allows the migratory ungulates of this park access to a much larger area of adjacent southern Botswana, including that country's Gemsbok National Park (26 000 sq km) and adjoining areas. Kalahari Gemsbok National Park is thus a relatively small part of an extensive ecosystem, within which migratory antelopes (gemsbok, springbok, red hartebeest, eland and blue wildebeest) move widely in search of favourable habitat conditions. Provision of artificial water supplies within Kalahari Gemsbok National Park does not influence these species' movements, apart from blue wildebeest (Mills & Retief 1984). Maintenance of the present size of the conservation areas and unrestricted movement of wildlife between them is essential if the natural ecosystem of the southern Kalahari is to persist (Van der Walt et al. 1984).

Apart from Kruger and Kalahari Gemsbok National Parks, all of South Africa's conservation areas are of moderate size (hundreds of sq km) or small (tens of sq km or less). The boundaries of most of these areas are completely fenced, and at least the larger antelope species have often been reintroduced. Large carnivores are usually absent, although the leopard (*Panthera pardus*) is still a ubiquitous predator of medium-sized and smaller antelopes in the northern and eastern Transvaal, and parts of Natal and the Cape Province. Under these conditions, populations of the large ungulates in the smaller national parks and in provincial reserves are managed to prevent overutilisation of the habitat. Antelope population management is achieved indirectly by veld management and directly by live capture and translocation, culling, or strictly controlled public sport hunting (Orange Free State). Most antelope populations in protected areas are maintained at stable levels, except for recent reintroductions and recently protected areas where indigenous populations are increasing. Smaller species such as grey duiker which are not effectively contained by game fences generally do not require direct management, and the annual population increments move off on to neighbouring land.

In the past, some antelope species and subspecies were introduced into national parks or provincial reserves outside their natural ranges, e.g., antelopes which were considered to be threatened, and for which no other protected areas were then available. Most of these "exotic" populations have now been or are being removed. It is the policy of the National Parks Board to re-establish where possible the full complement of game animals which formerly occurred in areas which are now national parks; great care is taken to obtain animals from the same (or closest available) gene pool, in accordance with genetic conservation principles (Greig 1979). Similar policies have also been developed by provincial nature conservation authorities, e.g., in the Transvaal and the Cape Province.

While many antelope species are more numerous on private land, the national parks and provincial reserves are vitally important as areas where the conservation of natural ecosystems, including representative examples of natural antelope communities, has top priority. The national parks are especially important because they cannot be deproclaimed or any of the land alienated without a two-thirds majority of Parliament (provincial nature reserves can be deproclaimed by the provincial authorities). The locations of the more important parks and reserves for antelope conservation are shown in Figs. 3 to 6. These include national parks, provincial reserves larger than 10 sq km (apart from those which lack major antelope populations), and a few smaller provincial reserves which contain significant antelope communities. In the Transvaal, the Orange Free State, Natal and the Cape Province, there are many provincial nature reserves which are less than 10 sq km in area and protect antelopes, but are not included in Figs. 3 to 6. These figures include only a few of the larger local authority reserves, and no private reserves apart from three large private nature reserves on the western border of Kruger National Park (Fig. 3). There are also substantial areas of State forest land, some proclaimed as nature reserves and wilderness areas, which protect antelope habitats; a few of these are indicated in the figures.

Examples of protected areas which contain substantial remnants of the characteristic antelope communities of the country's major natural vegetation zones (Fig. 1) include:

Fynbos and temperate forest—Bontebok and Tsitsikamma National Parks, De Hoop and Cape of Good Hope Nature Reserves.

Karoo—Karoo National Park, Hester Malan, Karoo and Rolfontein Nature Reserves. There are also several important conservation areas for the antelopes of the eastern Cape, in a region of widely varying terrain and vegetation where the southeastern Karoo converges with the southern highveld, eastern midlands, eastern fynbos/temperate forest, and southern humid subtropical zones, e.g., Mountain Zebra, Addo Elephant and Zuurberg National Parks, Andries Vosloo Kudu Reserve and Oviston Nature Reserve.

Kalahari thornveld—Kalahari Gemsbok National Park. The much smaller Augrabies Falls and Vaalbos National Parks, and Spitskop and Leon Taljaardt Nature Reserves are important protected areas of Karroid desert vegetation and Kalahari thornveld in the northern Cape.

Highveld—Willem Pretorius Game Reserve, Tussen-die-Riviere Game Farm, Golden Gate Highlands National Park and Suikerbosrand Nature Reserve. Several important reserves protect parts of the eastern escarpment, e.g., Natal's Giant's Castle Game Reserve and contiguous nature reserves and wilderness areas, Royal Natal National Park, and the Transvaal's Blyderivierspoort Nature Reserve.

Bushveld—Loskop Dam, Langjan, Nylsvley, Percy Fyfe and Doorndraai Dam Nature Reserves, Pilanesberg National Park.

Lowveld—Kruger National Park and the adjacent Timbavati, Klaserie and Sabi Sand Private Nature Reserves, Hans Merensky and Pongola Nature Reserves, and Itala Game Reserve.

Eastern midlands—Itala Game Reserve, which extends from *Acacia-Combretum* lowveld (altitude <900 m) and "middleveld" (altitude 900–1250 m) to open grassy highveld (altitude >1250 m), and the smaller Coleford, Kamberg and Mount Currie Nature Reserves.

Humid subtropical—Umfolozi/Corridor/Hluhluwe Game Re-

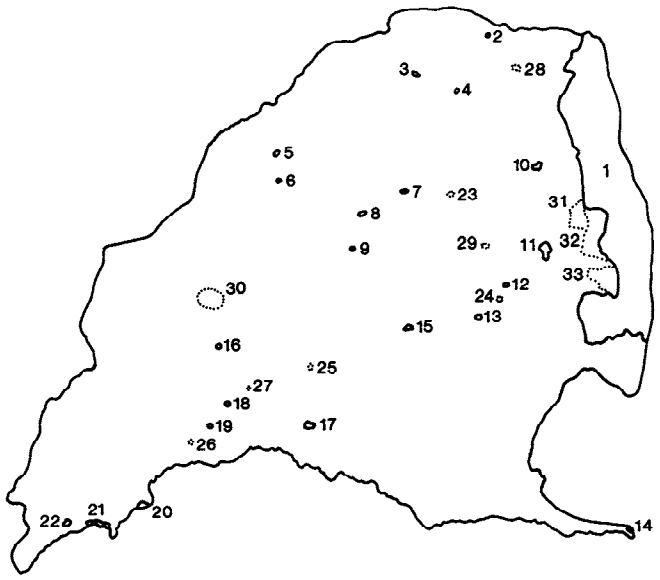

Fig. 3. Major conservation areas for antelope in the Transvaal. 1: Kruger National Park (19 485 sq km). Provincial nature reserves—2: Messina (34 sq km). 3: Langjan (48 sq km). 4: Happy Rest (15 sq km). 5: D'Nyala (85 sq km). 6: Hans Strijdom Dam (29 sq km). 7: Percy Fyfe (27 sq km, including a 12 sq km roan camp, 9 sq km sable camp, and 6 sq km tsessebe camp, each fenced separately). 8: Doorndraai Dam (72 sq km). 9: Nylsvley (31 sq km). 10: Hans Merensky (52 sq km). 11: Blyderiverspoort (226 sq km). 12: Ohrigstad Dam (25 sq km). 13: Verloren Vallei (60 sq km). 14: Pongola (69 sq km). 15: Loskop Dam (148 sq km). 16: Rustenberg (43 sq km). 17: Suikerbosrand (133 sq km). 18: Abe Bailey (19 sq km). 19: Boskop Dam (27 sq km). 20: Wolwespruit (23 sq km). 21: Bloemhof Dam (72 sq km). 22: S.A. Lombard (37 sq km). An additional 9 Transvaal Provincial Nature Reserves protect antelopes. Local authority nature reserves—23: Pietersberg (28 sq km). 24: Gustav Klingbiel. 25: Van Riebeeck (30 sq km). 26: Faan Meintjes (13 sq km). 27: Krugersdorp Game Reserve (14 sq km). Other areas—28: Nwanedi National Park (Venda) (40 sq km). 29: Potlake Nature Reserve (Lebowa) (30 sq km). 30: Pilanesberg National Park (Bophuthatswana) (550 sq km). 31: Klaserie Private Nature Reserve (630 sq km). 32: Timbavati Private Nature Reserve (600 sq km). 33: Sabi Sand Wildtuin Private Nature Reserve (530 sq km).

serve complex (which also supports significant populations of large carnivores), Mkuzi and Ndumu Game Reserves, and Eastern Shores Nature Reserve.

Conservation Measures Proposed

Maintenance of the generally satisfactory conservation status of South Africa's antelopes and other wildlife will require additional measures to those already in place. A major example is the need to extend the artificial water supplies within Kruger National Park and to safeguard this park's perennial rivers from the effects of progressive desiccation or serious pollution (Pienaar 1985; Joubert 1986b).

Further progress in antelope conservation is most likely to be achieved as part of the continued development of an ecosystem-based approach to conservation. Research is an essential part of this approach, to provide a better understanding of the functioning of natural ecosystems so that they may be conserved more effectively. An important example concerning antelopes is the need for detailed research on ungulate movements in the southern Kalahari and the mechanisms involved (Hall-Martin 1984).

Rapid human population growth and associated problems such as habitat degradation and soil erosion underline the need to develop land-use systems for all regions of South Africa which integrate the requirements of human populations with maintenance of the integrity of natural ecosystems. Ultimately, the survival of both man and wildlife depends on the conservation of natural life-support processes. As Hanks (1979) and others have pointed out, this will require a positive rural land-use strategy which recognises the prime importance of food production, but safeguards soil, natural habitats and wildlife. Reduction of the growth rate of the human population, and changes in education to increase awareness of the fundamental importance of environmental problems and the ecological value of natural ecosystems, may be vital features of such a land-use strategy.

Fig. 4. Major conservation areas for antelope in the Orange Free State. 1: Golden Gate Highlands National Park (62 sq km). Orange Free State provincial reserves—2: Willem Pretorius Game Reserve (120 sq km). 3: Erfenis Dam Nature Reserve (38 sq km). 4: Tussen-die-Riviere Game Farm (175 sq km). 5: Verwoerd Dam Nature Reserve (275 sq km). 6: Soetdoring Nature Reserve (62 sq km). 7: Sandveld Nature Reserve (377 sq km). 8: Koppies Dam Nature Reserve (43 sq km).

In some cases, limited exploitation of the natural resources within conservation areas will be necessary to make these areas more relevant to the needs of local people. This could include making some of the natural resources of protected areas available to surrounding human settlements, e.g., meat from culling operations, thatching grass and fuelwood. Such developments are already occurring in some areas, such as Bophuthatswana's Pilanesberg National Park.

Species Accounts

This section summarises information on the distribution, abundance and conservation status of each antelope species within the Republic of South Africa. Knowledge of the habitat, food preferences, behaviour and reproduction of antelopes was summarised by Smithers (1983).

Under "Conservation Measures Taken," the occurrence of each species in the conservation areas shown in Figs. 3 to 6 is summarised. Estimates of antelope populations within some of the major conservation areas are listed in Tables 2 to 6. These and additional population estimates given for other reserves in the text are based on the latest information available from the National Parks Board and the provincial conservation authorities. These estimates exclude a few populations of species which occur in conservation areas outside their natural ranges but are now being removed. Populations on private farmland are based on recent published (e.g., Howard & Marchant 1984) and unpublished surveys by provincial authorities.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: Formerly occurred widely within suitable habitat in the bushveld and lowveld of the northern and eastern Transvaal, and in the east from northeastern Natal to the southern coast. It still occurs widely but patchily within this range,

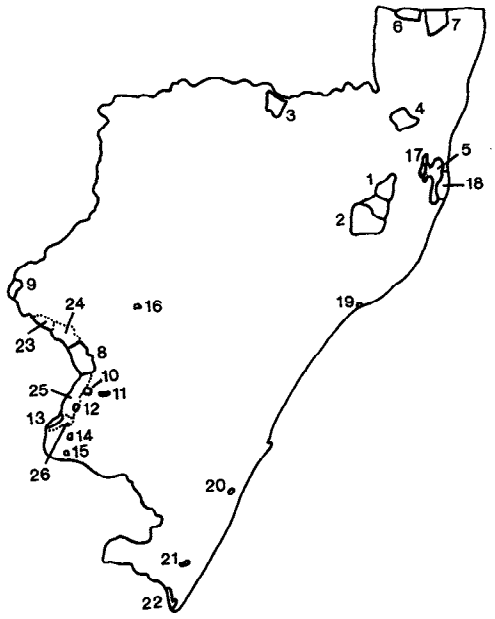

Fig. 5. Major conservation areas for antelope in Natal. Game reserves—1: Hluhluwe (231 sq km). 2: Umfolozi (478 sq km) (Hluhluwe and Umfolozi Game Reserves and the Corridor which separates them form a single complex of 960 sq km, within which movement of wildlife is unrestricted). 3: Itala (259 sq km). 4: Mkuzi (251 sq km). 5: St. Lucia (368 sq km; comprises the water area of Lake St. Lucia and islands within the lake). 6: Ndumu (101 sq km). 7: Tembe Elephant Reserve (KwaZulu) (290 sq km). 8: Giant's Castle (346 sq km). Nature reserves—9: Royal Natal National Park and Rugged Glen Nature Reserve (89 sq km). 10: Loteni (40 sq km). 11: Kamberg (22 sq km). 12: Vergelegen (12 sq km). 13: Mzimkulwana (23 sq km). 14: Coleford (13 sq km). 15: Mount Currie (16 sq km). 16: Weenen (43 sq km). 17: False Bay Park (22 sq km). 18: Eastern Shores (139 sq km). 19: Umlalazi (9 sq km). 20: Vernon Crookes (22 sq km). 21: Oribi Gorge (18 sq km). 22: Umtamvuna (31 sq km). Several other Natal Parks Board Nature Reserves protect antelopes. Other areas—23: Mlambonja Wilderness Area. 24: Mdedelelo Wilderness Area. 25: Mkhomazi Wilderness Area (540 sq km). 26: Mzimkulu Wilderness Area (283 sq km).

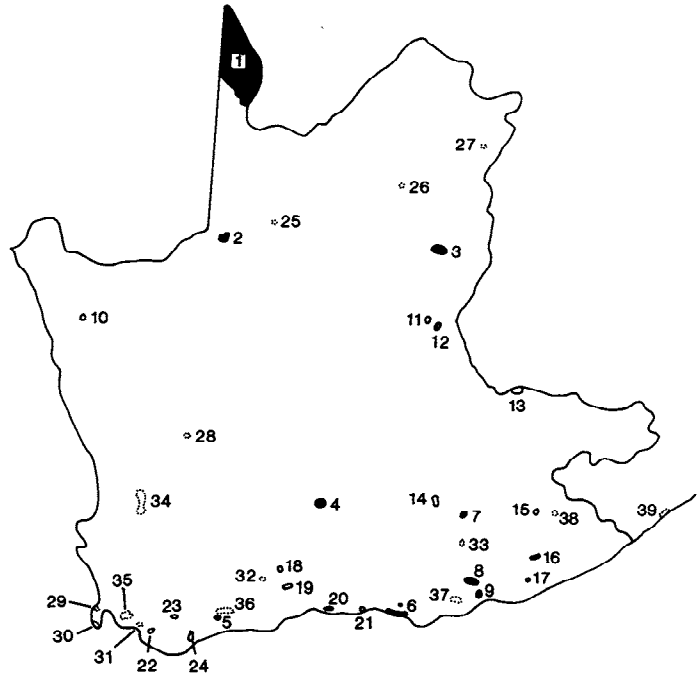

Fig. 6. Major conservation areas for antelope in the Cape Province. National parks—1: Kalahari Gemsbok (9591 sq km). 2: Augrabies Falls (94 sq km). 3: Vaalbos (210 sq km). 4: Karoo (270 sq km). 5: Bontebok (28 sq km). 6: Tsitsikamma Coastal (28 sq km) and Forest (5 sq km). 7: Mountain Zebra (65 sq km). 8: Zuurberg (210 sq km). 9: Addo Elephant (86 sq km). Provincial nature reserves—10: Hester Malan (66 sq km). 11: Rolfontein (69 sq km). 12: Doornkloof (88 sq km). 13: Oviston (130 sq km). 14: Karoo (145 sq km). 15: Commando Drift (60 sq km). 16: Andries Vosloo (65 sq km). 17: Thomas Baines (10 sq km). 18: Gamkapoort (80 sq km). 19: Gamka Mountain Reserve (94 sq km). 20: Goukamma (23 sq km). 21: Keurbooms River (8 sq km). 22: Salmonsdam (8 sq km). 23: Vrolijkheid Nature Conservation Station (18 sq km). 24: De Hoop (178 sq km). There are an additional 20 Cape Provincial Nature Reserves, many of which protect antelopes. Local authority nature reserves—25: Spitskop (11 sq km). 26: Kuruman (9 sq km). 27: Leon Taljaardt (9 sq km). 28: Akkerendam (23 sq km). 29: Table Mountain (29 sq km). 30: Cape of Good Hope (77 sq km). 31: Fernkloof (14 sq km). 32: Noukloof (28 sq km). 33: Bosberg (35 sq km). There are an additional 64 (mostly smaller) Local Authority Nature Reserves, many of which contain antelopes. Other areas—34: Cederberg Wilderness Area (710 sq km). 35: Hottentot-Hollands Nature Reserve (246 sq km). 36: Boosmansbos Wilderness Area (142 sq km). 37: Groendal Wilderness Area (250 sq km). 38: Tsolwana Game Park (Ciskei) (76 sq km). 39: Dwesa Nature Reserve (Transkei) (39 sq km).

and is locally common in the northern and eastern savannas of the Transvaal, in Natal and KwaZulu, and in the coastal forests of Transkei and the southern and eastern Cape. Total numbers unknown, but probably stable on private farmland and in conservation areas.

Status: Satisfactory (not threatened).

Conservation Measures Taken: Well represented in national parks and provincial reserves within its range (Tables 2–6). Major protected populations occur in Kruger and Zuurberg National Parks, and the Umfolozi/Corridor/Hluhluwe Game Reserve complex. Occurs in small to moderate numbers in numerous reserves not listed in Tables 3 to 6, such as Happy Rest, Hans Strijdom Dam and Ohrigstad Dam Nature Reserves (Transvaal), Pilanesberg National Park (Bophuthatswana) (population 400), St. Lucia Game Reserve, Eastern Shores, Loteni, Mt. Currie, Umtamvuna, Umlalazi, Oribi Gorge and Vernon Crookes Nature Reserves, and False Bay Park (Natal), Dwesa Nature Reserve (Transkei), Goukamma, Keurbooms River and Bosberg Nature Reserves, and Groendal Wilderness Area (Cape Province).

Nyala (*Tragelaphus angasii*)

Distribution & Population: Occurs naturally in the Transvaal lowveld (riparian woodlands of the Limpopo River and its larger tributaries east of 30°E, the northern section of Kruger National Park, and Pongola Nature Reserve in the extreme southeast of the province), northeastern Natal and KwaZulu; widely introduced to private farmland outside its natural range in the Transvaal, Natal and parts of the eastern Cape. Total population unknown, but larger than its former numbers and probably still increasing.

Status: Satisfactory.

Conservation Measures Taken: Abundant in the game reserves of northeastern Natal (total numbers >20 000), with major populations in Umfolozi/Hluhluwe, Mkuzi and Ndumu (Table 5). Also occurs in St. Lucia Game Reserve, Eastern Shores Nature Reserve and False Bay Park. Common in the northern sector of Kruger National Park (Table 2), and occurs in two Transvaal reserves (Table 3).

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: Formerly occurred in the western, northern and eastern Transvaal, northeastern Natal, and locally in the Orange Free State and the northeastern and southeastern Cape Province. Persists in settled areas within its natural range to a greater extent than most other large antelopes and remains common and widespread. Introduced to several regions outside

Table 2

Antelope Populations in National Parks (based on aerial and/or ground surveys). Where numbers are unknown, species are indicated as abundant (Ab), common (C), rare (R), or vagrant only (V). Dashes indicate that the species is absent

Species	Kruger[1]	Kalahari Gemsbok[2]	Karoo	Augrabies Falls	Golden Gate Highlands	Mountain Zebra	Tsitsikamma Forest & Coastal	Bontebok	Addo Elephant[3]	Zuurberg	Vaalbos
Bushbuck	1000+	–	–	–	–	–	C	–	120–200	Ab	–
Nyala	750–1000	–	–	–	–	–	–	–	–	–	–
Kudu	8500–11 000	V	59	V	–	40–50	–	–	360+	Ab	±100
Eland	490–950	100–10 000	–	19	80	154	–	–	60	–	2
Blue Duiker	–	–	–	–	–	–	C	–	–	C	–
Natal Red Duiker	R	–	–	–	–	–	–	–	–	–	–
Grey Duiker	C	±500	±50	–	–	±40	–	±20	230–400	C	±30
Waterbuck	2700–5000	–	–	–	–	–	–	–	–	–	–
Southern Reedbuck	1000+	–	–	–	–	–	–	–	–	–	–
Mountain Reedbuck	250+	–	134	–	±50	410	–	–	–	±200	–
Roan	310–420	–	–	–	–	–	–	–	–	–	–
Sable	1630–2240	–	–	–	–	–	–	–	–	–	–
Gemsbok	–	5000–7500	28	–	–	–	–	–	–	–	–
Black Wildebeest	–	–	56	–	150+	112	–	–	–	–	–
Blue Wildebeest	8600–14 600	400–4400	–	–	–	–	–	–	–	–	–
Red Hartebeest	–	200–1000	19	–	–	80+	–	–	20+	–	312
Lichtenstein's Hartebeest	23	–	–	–	–	–	–	–	–	–	–
Bontebok	–	–	–	–	–	–	–	300	–	–	–
Blesbok	–	–	–	–	400+	126	–	–	–	–	–
Tsessebe	830–1180	–	–	–	–	–	–	–	–	–	–
Klipspringer	C	–	112	Ab	–	20+	–	–	–	–	–
Oribi	R	–	–	–	±20	–	–	–	–	–	–
Steenbok	C	1000–2000	±100	±20	–	±40	–	±15	–	–	±60
Cape Grysbok	–	–	–	–	–	–	C	30+	10–40	C	–
Sharpe's Grysbok	R	–	–	–	–	–	–	–	–	–	–
Suni	R	–	–	–	–	–	–	–	–	–	–
Impala	91 900–137 000	–	–	–	–	–	–	–	–	–	–
Springbok	–	4000–10 000	747	60	60	210	–	–	–	–	277
Grey Rhebok	–	–	283	–	±30	–	–	200+	–	–	–

[1] Range of annual aerial censuses of larger species by fixed-wing aircraft 1980–1987, in which the estimated percentage of each population counted is: kudu (55%), eland (85%), waterbuck (45–50%), roan (80%), sable (90–95%), wildebeest (85%), tsessebe (80%), impala (60%). The status of smaller species is based on detailed ground observations (e.g., Pienaar 1963, 1969).

[2] Populations of major species fluctuate seasonally as they migrate within the southern Kalahari ecosystem, of which Kalahari Gemsbok National Park is only a small part.

[3] Populations fluctuate naturally (bushbuck, grey duiker), in response to competition from other species (grysbok), or through removal of large numbers of surplus animals (e.g., kudu, eland).

its natural range, e.g., central Natal. Total numbers well into the hundreds of thousands; population stable.

Status: Satisfactory.

Conservation Measures Taken: Well represented in conservation areas (Tables 2–6), with total numbers of >10 000 in national parks (mainly in Kruger), >2000 in the game reserves of northeastern Natal, >1000 in the nature reserves of both the Transvaal and the Cape Province, and >400 in Orange Free State reserves. Kudu occur in many protected areas in addition to those listed in Tables 2 to 6, e.g., Klaserie (population 4–800), Timbavati (about 1000) and Sabi Sand (about 1000) Private Nature Reserves, Hans Strijdom Dam, Ohrigstad Dam and Gustav Klingbiel Nature Reserves, and Krugersdorp Game Reserve (Transvaal), Pilanesberg National Park (population 600) (Bophuthatswana), Nwanedi National Park (Venda), and Potlake (Lebowa), Weenen (Natal) and Gamkapoort (Cape Province) Nature Reserves.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Formerly occurred throughout in suitable habitat (Smithers 1983). Within the Republic of South Africa, naturally occurring eland are now restricted to the extreme north of the Cape Province, parts of the Transvaal, and the Natal Drakensberg. This species is popular among farmers and has been reintroduced widely. Many of these reintroductions onto private land involve small numbers of animals which are not doing well. It appears that eland require large areas (>40 sq km), especially in savanna, which is probably the principal factor limiting population growth. The total population exceeds 10 000, and is stable or increasing.

Table 3

Major Antelope Populations in Transvaal Provincial Nature Reserves (several reserves not listed in this table also contain significant populations of some antelopes; see species accounts in the text). Where numbers are unknown, species are indicated as common (C) or rare (R). Dashes indicate that the species is absent

Species	Messina	Langjan	D'Nyala	Percy Fyfe	Doorndraai Dam	Nylsvley	Hans Merensky	Blyderivierspoort	Pongola	Loskop Dam	Rustenberg	Suikerbosrand	Bloemhof Dam	S.A. Lombard
Bushbuck	R	–	R	20	45	R	20	C	70	R	–	–	–	–
Nyala	23	–	–	–	–	–	–	–	100	–	–	–	–	–
Kudu	25	65	70	23	60	50	85	45	85	425	50	40	–	–
Eland	–	17	12	–	–	–	–	–	–	21	20	357	55	16
Natal Red Duiker	–	–	–	–	–	–	–	C	C	–	–	–	–	–
Grey Duiker	C	C	C	C	70	30	C	C	C	C	50	80	C	C
Waterbuck	–	38	80	40	43	57	25	25	–	81	20	–	–	–
Southern Reedbuck	–	–	–	20	–	50	10	–	150	30	8	23	–	–
Mountain Reedbuck	–	–	R	12	–	–	–	C	C	215	180	50	–	–
Roan	–	–	–	62	37	40	–	–	–	–	–	–	–	–
Sable	29	3	–	40	31	–	100+	–	–	44	27	–	–	–
Gemsbok	–	62	–	–	–	–	–	–	–	–	–	–	150	31
Black Wildebeest	–	–	–	–	–	–	–	–	–	–	–	170	82	176
Blue Wildebeest	42	11	10	–	17	16	31	27	475	155	–	–	–	–
Red Hartebeest	–	30	20	–	–	–	–	–	–	–	40	203	200	88
Blesbok	–	–	–	–	–	–	–	–	–	–	–	911	110	72
Tsessebe	–	–	10	88	150	40	–	–	–	–	–	–	–	–
Klipspringer	R	–	R	20	40	–	12	C	16	20	20	–	–	–
Oribi	–	–	–	–	–	–	–	–	–	14	8	20	–	–
Steenbok	C	C	C	C	40	25	C	C	C	C	15	50	C	C
Sharpe's Grysbok	C	–	R	–	–	–	R	–	–	–	–	–	–	–
Suni	–	–	–	–	–	–	–	–	R	–	–	–	–	–
Impala	210	250	250	90	330	200	475	300	760	720	100	–	–	42
Springbok	–	–	–	–	–	–	–	–	–	–	115	260	400	366
Grey Rhebok	–	–	–	–	–	–	–	C	–	–	–	81	–	–

Status: Satisfactory.

Conservation Measures Taken: Stable or increasing populations occur in the national parks (total numbers several thousand), and the provincial reserves of the Transvaal (several hundred), the Orange Free State (several hundred), Natal (>1000) and the Cape Province (several hundred). The largest populations in the national parks (Table 2) are in Kalahari Gemsbok (average population about 1000) and Kruger (common in the northern district). In the Transvaal, eland are numerous in Suikerbosrand Nature Reserve (Table 3) and occur in smaller numbers elsewhere, including Ohrigstad Dam, Boskop Dam, Gustav Klingbiel, Pietersberg, Faan Meintjes and Van Riebeeck Nature Reserves, and Krugersdorp Game Reserve. Tussen-die-Riviere Game Farm supports the largest protected eland population in the Orange Free State (Table 4). In Natal, the species is common in Giant's Castle Game Reserve (Table 5) and adjacent reserves and wilderness areas, with a total population of about 1300 in the Natal Drakensberg. Eland occur widely in Cape Province reserves (Table 6), including Akkerendam, Cape of Good Hope and Noukloof Nature Reserves, and in the conservation areas of the Black States, e.g., Pilanesberg (population 450) and Nwanedi National Parks, Dwesa Nature Reserve and Tsolwana Game Park.

Table 4

Major Antelope Populations in Orange Free State Provincial Nature Reserves. Where numbers are unknown, species are indicated as common (C) or rare (R). Dashes indicate that the species is absent

Species	Willem Pretorius	Tussen-die-Riviere	Soetdoring	Erfenis Dam	Sandveld	Koppies Dam	Verwoerd Dam
Bushbuck	R	–	–	–	–	–	–
Kudu	46	378	–	–	–	–	–
Eland	118	319	17	–	210	–	–
Grey Duiker	R/C	R	C	R	C	C	R
Southern Reedbuck	24	–	–	–	–	–	–
Mountain Reedbuck	157	299	R	R	–	–	426
Gemsbok	86	131	54	–	148	–	–
Black Wildebeest	333	454	294	133	61	314	333
Blue Wildebeest	–	313	–	–	24	–	–
Red Hartebeest	142	323	38	5	247	–	16
Blesbok	565	1401	292	49	–	31	386
Steenbok	C	C	178	C	C	C	C
Impala	233	839	210	–	–	13	–
Springbok	738	1083	403	70	492	412	1286

Table 5

Major Antelope Populations in Natal Game Reserves (several smaller nature reserves also contain significant populations of some antelopes; see species accounts in the text). Where numbers are unknown, species are indicated as abundant (Ab), common (C) or rare (R). Dashes indicate that the species is absent

Species	Umfolozi/ Corridor/ Hluhluwe	Mkuzi	Giant's Castle	Royal Natal NP	Ndumu	Itala
Bushbuck	480	R	R/C	±25	C	C
Nyala	12000	3700	–	–	4500	±100
Kudu	1500	560	–	–	–	200
Eland	–	–	640	–	–	70
Blue Duiker	R	–	–	–	–	–
Natal Red Duiker	C	C	–	–	C	–
Grey Duiker	Ab	Ab	Ab	±30	Ab	Ab
Waterbuck	920	–	–	–	–	40
Southern Reedbuck	170	R/C	35	–	140	150
Mountain Reedbuck	140	±50	100–250	215	–	R/C
Blue Wildebeest	1800	470	–	–	–	400
Blesbok	–	–	150	13	–	–
Tsessebe	–	–	–	–	–	27
Klipspringer	±10	±10	±10	20–60	–	20–30
Oribi	–	–	50–200	–	–	±5
Steenbok	300+	300+	–	–	–	C
Suni	–	2000+	–	–	1000+	–
Impala	7300	7000	–	–	480	300
Grey Rhebok	–	–	200–400	95	–	–

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: Occurs in dense evergreen indigenous forest and scrub in eastern coastal areas, from northern Natal to the eastern Cape Province, and in some inland areas of Natal with suitable habitat up to an altitude of 1300 m. Still occurs widely where its habitat has not been destroyed. Numbers unknown, but locally common.

Status: Satisfactory at present, but could be threatened in the long term by the progressive destruction of its habitat in non-protected areas. This species and the Natal red duiker were classed as rare by Skinner et al. (1977).

Conservation Measures Taken: Common and increasing in numbers in the Tsitsikamma and Zuurberg National Parks in the eastern Cape (Table 2). This species was historically plentiful in the indigenous forests of the southeastern Cape Province. Its

Table 6

Major Antelope Populations in Cape Province Nature Reserves (several Cape reserves not listed in this table also contain significant populations of some antelopes; see species accounts in the text). Species which occur in unknown numbers are indicated as present (P). Dashes indicate species which are absent

	Provincial Reserves									Local Authority Reserves		
Species	De Hoop	Hester Malan	Andries Vosloo	Commando Drift	Doornkloof	Karoo	Oviston	Rolfontein	Thomas Baines	Kurugman	Spitskop	Leon Taljaardt
Bushbuck	P	–	P	–	–	–	–	–	23	–	–	–
Kudu	–	–	400	P	15	500	45	40	16	7	–	–
Eland	150	–	96	–	–	–	P	P	P	26	13	33
Blue Duiker	–	–	P	–	–	–	–	–	P	–	–	–
Grey Duiker	P	P	P	P	100	280	6	25	30	P	P	P
Mountain Reedbuck	–	–	–	9	1320	150	364	500	22	–	–	–
Gemsbok	–	70	–	–	–	–	–	–	–	29	43	45
Black Wildebeest	–	–	–	35	–	27	184	46	5	–	–	15
Blue Wildebeest	–	–	–	–	–	–	–	–	–	–	–	17
Red Hartebeest	–	–	33	–	–	–	130	60	–	12	–	48
Bontebok	400	–	–	–	–	–	–	–	–	–	–	–
Blesbok	–	–	–	62	–	20	150	8	–	34	–	30
Klipspringer	P	P	–	–	–	22	–	–	–	–	–	–
Steenbok	P	P	P	P	100	860	40	100	–	P	P	P
Cape Grysbok	P	–	–	–	–	–	–	–	P	–	–	–
Springbok	10	90	20	65	–	52	3170	150	–	97	270	60
Grey Rhebok	P	–	–	–	–	–	20	–	–	–	–	–

abundance in this region declined from the late 1940s, but the numbers of sightings have increased markedly over the last decade in both the Tsitsikamma Forest and Coastal National Parks, following the proclamation of these parks in 1964 and strict control of poaching and access by dogs (Crawford & Robinson 1984). The blue duiker does not occur widely in the major reserves of Natal (Table 5) or the Cape Province (Table 6), but it is common in some of Natal's coastal nature reserves, such as Vernon Crookes, Oribi Gorge, Umtamvuna and Umlalazi, and occurs in several nature reserves in the Cape, e.g., Goukamma and Keurbooms River.

Natal Red Duiker (*Cephalophus natalensis*)

Distribution & Population: Occurs in the low-lying regions of northeastern Natal and KwaZulu, possibly extending southwards to the coastal regions of central and southern Natal, and in the escarpment forests and lowveld riverine scrub and thicket of the eastern Transvaal and the Swazi homeland. This duiker is often thought to be rare because of its secretive habits and limited distribution, but it is common within suitable habitat. A survey conducted in 1984 estimated that approximately 5000 red duiker occurred in the Transvaal. Numbers are probably stable in protected areas, but declining elsewhere because of loss of habitat to agriculture.

Status: Not threatened at present, but its long-term survival could be threatened by agricultural development of much of its prime habitat outside conservation areas, e.g., for sugar cane and pineapple production.

Conservation Measures Taken: Occurs in small numbers in Kruger National Park, but no other national parks are within its distributional range (Table 2). Common in a few reserves in the eastern Transvaal which contain suitable habitat (Table 3) including Happy Rest Nature Reserve. Over 1000 ha of forest habitat containing red duiker is conserved in the Transvaal. Well represented in the major reserves of northeastern Natal (Table 5), and also occurs in St. Lucia Game Reserve, False Bay Park and Eastern Shores Nature Reserve.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Formerly occurred throughout the country wherever there was sufficient cover. Remains widespread and very common, persisting in the face of agricultural development and even feeding at night in gardens in built-up areas within towns. Total population unknown but stable.

Status: Satisfactory.

Conservation Measures Taken: A ubiquitous species which occurs naturally in most of the national parks (Table 2) and all of the major provincial reserves (Tables 3–6). It also occurs in all of the reserves which are shown in Figs. 3 to 6 but are not included in Tables 3 to 6, with a few exceptions such as Abe Bailey and Boskop Dam Nature Reserves (Transvaal), Vrolijkheid Nature Conservation Station, and Goukamma, Akkerendam, Table Mountain and Noukloof Nature Reserves (Cape Province).

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: This species' natural range within the Republic of South Africa is confined to the bushveld and lowveld of the western, northern and eastern parts of the Transvaal, a few areas in northeastern Natal, and originally the Cape/Botswana border. It still occurs widely in suitable habitat in the Transvaal, with the greatest numbers on private land. In Natal, the major population is in Umfolozi/Hluhluwe Game Reserves; it has been introduced in small numbers to private farms elsewhere in the province. The waterbuck's total population in South Africa probably exceeds 15 000 and is increasing.

Status: Satisfactory.

Conservation Measures Taken: Common in Kruger National Park (Table 2). Common and increasing in the Umfolozi/Corridor/Hluhluwe Game Reserve complex and reintroduced into Itala Game Reserve (Table 5). Occurs widely in the provincial nature reserves of the Transvaal (Table 3), with total numbers >400; also present in some local authority reserves, e.g., Faan Meintjes Nature Reserve, and in Klaserie (population 1–200), Timbavati (about 200) and Sabi Sand (about 250) Private Nature Reserves. Waterbuck also occur in Pilanesberg National Park (130) and Potlake Nature Reserve.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Formerly occurred widely in the central and eastern Transvaal, the Orange Free State, Natal, and the eastern Cape Province. It has been eliminated from most of its former range, e.g., in the Orange Free State and the eastern Cape, but still occurs in scattered areas on private land in the Transvaal and widely in Natal.

In the Transvaal it is an uncommon species, and populations tend to fluctuate with rainfall (through its influence on habitat quality); numbers are currently low because of recent droughts. It occurs in large numbers on private farms in the midlands and highlands of Natal, where it has benefited from the widespread use of frost-tolerant pasture grasses as winter feed for livestock plus irrigation during the dry winter months. As a result, populations of this reedbuck are artificially high in many areas of Natal farmland, where they compete with livestock for winter grazing (Howard 1984a). The total population of this species in South Africa exceeds 10 000 and is probably increasing.

Status: Satisfactory.

Conservation Measures Taken: The country's largest protected population of southern reedbuck is in Natal's Eastern Shores Nature Reserve, where numbers increased rapidly during the 1970s until the reserve's carrying capacity was exceeded (Venter 1979). Large numbers were subsequently captured live and removed (Howard 1984b) to reduce the population; >5000 reedbuck remain in this reserve. There is also a major protected population in Kruger National Park (Table 2), with moderate numbers in the game reserves of Natal (Table 5; this species also occurs in several nature reserves, such as Loteni, Vernon Crookes, Umtamvuna, Umlalazi, and False Bay Park), and several nature reserves in the Transvaal (Table 3; there is also a population of about 20 southern reedbuck in Ohrigstad Dam Nature Reserve). In the Orange Free State, it has recently been reintroduced to Willem Pretorius Game Reserve (Table 4), where the population is increasing.

Mountain Reedbuck (*Redunca fulvorufula*)

Distribution & Population: Still occurs widely on steep, hilly terrain with open grassland or lightly wooded savanna within its former range in the Transvaal, Natal, the eastern and southern Orange Free State, and the eastern Cape Province. Locally common in suitable habitat, e.g., game surveys estimated a population of 25 000 in the Orange Free State in 1985–86 (compared to 20 500 in 1970–71). Total population unknown but probably stable.

Status: Satisfactory.

Conservation Measures Taken: Occurs in several national parks (Table 2; total numbers >1000) and well represented in provincial reserves (Tables 3–6), with >500 in Transvaal, Orange Free State and Natal reserves and >1000 in Cape Province nature reserves. Some populations fluctuate naturally with rainfall, e.g., in Mountain Zebra National Park. Mountain reedbuck also occur widely

in reserves not listed in Tables 3 to 6, e.g., Happy Rest, Hans Strijdom Dam, Ohrigstad Dam and Verloren Vallei Nature Reserves (Transvaal), Kamberg, Loteni, Mount Currie, Mzimkulwana, Vergelegen, Vernon Crookes and Weenen Nature Reserves (Natal), and Bosberg Nature Reserve (Cape Province). It is also present in Pilanesberg National Park (population about 1200) and Tsolwana Game Park.

Bluebuck (*Hippotragus leucophaeus*)

Distribution & Status: This endemic species was confined historically to a limited area of the southwestern Cape, where it was apparently uncommon. It was soon wiped out by early European settlers, the last known specimen being shot in 1799 or 1800. It is now extinct.

Roan (*Hippotragus equinus*)

Distribution & Population: This species' former range included much of the bushveld and lowveld regions of the Transvaal, and the northeastern Cape Province. It has been eliminated from most of this range. Roan occur naturally in Kruger National Park and the Waterberg Plateau in the western Transvaal, with one naturally occurring and three introduced herds in Transvaal provincial nature reserves. The total population is about 600, including >300 in Kruger National Park (Table 2), about 150 in provincial nature reserves, and probably about 120 on private land in the Waterberg. Numbers are gradually increasing.

Status: Rare.

Conservation Measures Taken: A rare species in Kruger National Park (Joubert 1974), where its habitat is managed to promote its survival and the population is inoculated annually against anthrax, to which this species is highly susceptible. It is planned to reintroduce roan to Vaalbos National Park. The populations in Transvaal reserves (Table 3) are stable (Nylsvley) or increasing (other reserves, including a small population (13) in Hans Strijdom Dam Nature Reserve). A privately owned and managed refuge area (>260 sq km) is being developed in the Waterberg which it is hoped will stimulate the increasing trend in the population. Small numbers of roan have been reintroduced to Krugersdorp Game Reserve and Pilanesberg National Park, and it is planned to reintroduce this species to Natal's Itala Game Reserve in the near future.

Sable (*Hippotragus niger*)

Distribution & Population: This species occurred naturally in the bushveld and lowveld of the northern and eastern Transvaal. It has been widely reintroduced to conservation areas and private land within its natural range, and in small numbers to private land in other parts of the country. Its distribution is expanding because of its high value as a trophy animal. The population is increasing and currently exceeds 3500, including >2000 in Kruger National Park (Table 2). A survey conducted in 1985 recorded 1400 sable in 90 localities throughout the bushveld and lowveld of the Transvaal (excluding Kruger National Park), an increase from 800 in 1974.

Status: Rare. Numbers are increasing satisfactorily.

Conservation Measures Taken: Kruger National Park contains the country's major sable population. There are >250 sable in Transvaal provincial nature reserves (Table 3). Most of the population of Hans Merensky Nature Reserve has moved onto surrounding private land during the current drought. Sable also occur in a few local authority reserves, e.g., Krugersdorp Game Reserve and Faan Meintjes Nature Reserve, and there is a small population (85) in Pilanesberg National Park.

Gemsbok (*Oryx gazella gazella*)

Distribution & Population: Formerly widespread in the more arid parts of the country, occurring mainly in the Karoo and Kalahari thornveld of the northern and central Cape Province, extending eastwards into the Kalahari associations of the northwestern Orange Free State and the western Transvaal. It is in great demand among farmers because of its trophy value, and is now fairly common on farmland within its original range. Gemsbok have been widely introduced to other areas, such as numerous bushveld farms in the northern Transvaal. The total population exceeds 10 000 and is increasing.

Status: Satisfactory.

Conservation Measures Taken: The major protected population is in Kalahari Gemsbok National Park (Table 2), where numbers fluctuate with seasonal movements but the bulk of the population is resident. The reintroduced population in Karoo National Park is gradually increasing, and it is planned to reintroduce the species to Vaalbos and Augrabies Falls National Parks. There are several hundred gemsbok in the provincial nature reserves of the Transvaal (Table 3) and the Orange Free State (Table 4), and it also occurs in some of the larger local authority nature reserves, e.g., Pietersberg and Faan Meintjes, and in Lebowa's Potlake Nature Reserve. In the Cape Province, protected populations outside Kalahari Gemsbok National Park occur mainly in local authority nature reserves in the northern Cape (Table 6; also present in Akkerendam Nature Reserve).

Black Wildebeest (*Connochaetes gnou*)

Distribution & Population: Formerly occurred in vast numbers throughout the Orange Free State, extending westwards into the eastern and central Cape Province, northwards into the southern Transvaal, and eastwards into Natal. By the end of the 19th century, excessive hunting had reduced it to a few surviving animals on two farms in the Orange Free State. Protection by concerned farmers, and subsequently by provincial and national conservation authorities has enabled the species to recover gradually from the brink of extinction. It has been widely reintroduced to conservation areas and private farmland within its former range, and to farmland outside its natural range. Live animals are not traded as freely as for some other game species, since the movement of wildebeest is strictly controlled to prevent the spread of malignant catarrh. The total population now numbers well into the thousands, with the largest numbers in the Orange Free State (7000 in 1985–86, compared to 1900 in 1970–71) and >1000 in the Transvaal, and it continues to increase.

Status: Satisfactory.

Conservation Measures Taken: Total numbers of black wildebeest in conservation areas exceed 3300, including >1900 in Orange Free State provincial nature reserves (Table 4), well over 300 in national parks (Table 2), >650 in Transvaal nature reserves (Table 3; also occurs in populations of up to 80 animals in Abe Bailey, Boskop Dam and Wolwespruit Nature Reserves, and other Transvaal provincial reserves not shown in Fig. 3, and present in some local authority nature reserves, such as Faan Meintjes and Van Riebeeck), and >350 in Cape Province nature reserves (Table 6; occurs in additional reserves such as Akkerendam Nature Reserve). It also occurs in several small reserves in Natal, and in Ciskei's Tsolwana Game Park.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: This species' former range within the Republic of South Africa extended from the Kalahari thornveld through the bushveld to the lowveld. It has been widely reintroduced to farmland within these regions, and introduced widely elsewhere. The total population numbers well into the tens of thousands and is increasing, although this increase is limited by restrictions on the movement of wildebeest to control the spread of malignant catarrh. In the Transvaal, for example, it

may only be translocated to farms with existing herds of the species.

Status: Satisfactory.

Conservation Measures Taken: The major protected populations occur in Kruger and Kalahari Gemsbok National Parks (Table 2), Klaserie (population about 1000), Timbavati (1500–2000) and Sabi Sand (about 750) Private Nature Reserves in the Transvaal, Pilanesberg National Park (population recently reduced from 1000 to 400) in Bophuthatswana, and the Umfolozi/Corridor/Hluhluwe Game Reserve complex in Natal (Table 5). The population in Kruger National Park declined markedly during the 1970s, probably because of the effects of above-average rainfall on the vegetation and lion predation (Smuts 1978), but numbers have subsequently recovered with the onset of drier conditions in the early 1980s. In Kalahari Gemsbok National Park, there is a small resident population of about 400 which is augmented annually by migratory animals (normally about 4000, but up to 100 000 in exceptional years) which spend a few months in the park. Blue wildebeest do not occur in any other national park at present (Table 2), but will probably be reintroduced to Vaalbos National Park in the near future.

This species is well represented in Pongola and other nature reserves in the Transvaal (Table 3; also occurs in several local authority reserves, e.g., Krugersdorp Game Reserve, Gustav Klingbiel and Pietersberg Nature Reserves), Tussen-die-Riviere Game Farm in the Orange Free State (Table 4), and the game reserves of northern Natal (Table 5). Very few are protected in the Cape Province outside Kalahari Gemsbok National Park (Table 6). Blue wildebeest also occur in Nwanedi National Park and Potlake Nature Reserve.

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Population: This hartebeest formerly occurred throughout the Cape Province, in parts of the Orange Free State and Natal, and in the western Transvaal. Naturally occurring populations are now confined to the northern Cape, but it has been reintroduced widely to conservation areas and private farmland, especially in the drier regions of the northern Cape, the Orange Free State and the Transvaal. It is now a common species, with overall numbers increasing. In the Orange Free State, for example, the population increased from 150 in 1970–71 to 1600 in 1985–86. It has been introduced to many private farms outside its natural range, e.g., hundreds of animals have been imported from South West Africa/Namibia to the Transvaal lowveld during the past decade, but their survival rate is not known.

Status: Satisfactory.

Conservation Measures Taken: Total numbers in protected areas exceed 3000. It occurs in several national parks (Table 2; the reintroduced population in Karoo National Park is increasing slowly), and nature reserves in the Transvaal (Table 3; occurs in several additional reserves, e.g., Abe Bailey, Boskop Dam, Wolwespruit, Pietersberg, Faan Meintjes and Van Riebeeck Nature Reserves), the Orange Free State (Table 4), and the Cape Province (Table 6; also occurs in Cape of Good Hope Nature Reserve). It is planned to reintroduce this species to De Hoop and other provincial nature reserves in the southwestern Cape. In Natal, rapidly growing herds are now established after introduction into Kamberg, Weenen and same smaller reserves. Red hartebeest also occur in several reserves in the Black States, including Pilanesberg National Park (population 350), Potlake and Dwesa Nature Reserves, and Tsolwana Game Park.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution, Population & Status: This species probably reached the southern limits of its continental distribution in the northeastern Transvaal, including what is now the northern part of Kruger National Park, and in the southeastern Transvaal and northern Natal on the Pongola River (Smithers 1983; Penzhorn 1985). The hartebeest which occurred in these areas were shot out by indiscriminate hunters in the late 19th or early 20th century. A small number of Lichtenstein's hartebeest were recently captured in Kasungu National Park, Malawi, and translocated to Kruger National Park, to form a breeding nucleus for the re-establishment of this species in South Africa (Botha 1985). A second operation to translocate Lichtenstein's hartebeest from Malawi to South Africa was undertaken by a private game catcher. This resulted in the population at Kruger receiving another 13 animals, and there are also 15 animals on private land in the Transvaal.

Bontebok (*Damaliscus dorcas dorcas*)

Distribution & Population: Historically confined to the coastal plain of the southwestern Cape Province where it was locally abundant, the bontebok was almost exterminated by hunting but was saved from extinction in the mid-19th century by a few Cape farming families who protected the small remnant populations. Since the proclamation of the original Bontebok National Park in 1931, this antelope's numbers have gradually increased. The total population exceeded 800 in 1969 and is now >1500. Dispersal of surplus animals from Bontebok National Park by the National Parks Board has enabled the species to become established in Cape provincial nature reserves and on private farms. It has been introduced to areas outside its natural range in the eastern Cape and the Orange Free State. Some farmers have interbred bontebok with blesbok, and this poses a major threat to the subspecies.

Status: Rare. Now well out of danger as numbers continue to increase.

Conservation Measures Taken: The main protected populations are in Bontebok National Park (Table 2), where numbers are maintained at or below 300, and De Hoop Nature Reserve (Table 6). It also occurs in a few other reserves within its original range, e.g., Cape of Good Hope Nature Reserve (population about 150).

Blesbok (*Damaliscus dorcas phillipsi*)

Distribution & Population: The blesbok's historical distribution included the highveld of the Orange Free State and the southern Transvaal, parts of western Natal, and the northern Karoo in the Cape Province. It was separated by >300 km from the conspecific bontebok. Although blesbok occurred in enormous populations in regions such as the highveld when the South African hinterland was first explored by Europeans, excessive hunting had reduced its numbers to about 2000 by the late 19th century. Since then it has made a spectacular recovery, mainly on private farmland, and has been widely translocated to parts of the country both within and outside its natural range. While introduced populations appear to be doing well in many regions, e.g., throughout much of Natal, in other areas it is not thriving outside its natural range. In the Transvaal bushveld, for example, numerous populations were successfully established 15–20 years ago but have recently declined. The cause is not known, but is certainly related to suboptimal habitat. Blesbok is now one of the three major commercial game species in the Republic. The total population on farmland exceeded 96 000 in 1971 and currently numbers in the hundreds of thousands, with, for example, 85 000 in the Orange Free State in 1985–86 (compared to 43 700 in 1970–71), and tens of thousands in the Transvaal.

Status: Satisfactory.

Conservation Measures Taken: This antelope is well represented in protected areas, although only a very small proportion of the total population occurs in proclaimed conservation areas.

There are >2700 in Orange Free State provincial reserves (Table 4), >1600 in Transvaal reserves (Table 3; also occurs in other reserves such as Abe Bailey (population 90), Boskop Dam (125), Wolwespruit (130), Gustav Klingbiel (>450), Faan Meintjes and Van Riebeeck Nature Reserves, and Krugersdorp Game Reserve), and several hundred in two national parks (Table 2) and various reserves in Natal (Table 5; also present in a few nature reserves, e.g., Coleford and Mount Currie) and the Cape Province (Table 6; occurs in a few additional local authority nature reserves, e.g., Akkerendam). Blesbok also occur in Dwesa Nature Reserve and Tsolwana Game Park. Hybridisation with bontebok is a threat, but because of the much larger numbers of blesbok it is less of a threat to blesbok than to bontebok.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Formerly occurred in bushveld and lowveld in the western, northern and eastern Transvaal, northern Cape and northern Natal. The tsessebe was eliminated from most of its former range by hunting and habitat degradation. The largest surviving population is in Kruger National Park, and it has been reintroduced to provincial nature reserves and private farms, mainly in the Transvaal. The total population exceeds 2000 and is increasing.

Status: Rare. Successful management of this species in Kruger National Park and provincial nature reserves and its widening distribution on private land have largely removed the threat to its survival in South Africa.

Conservation Measures Taken: Occurs naturally in Kruger National Park (Table 2) and reintroduced to four Transvaal provincial nature reserves (Table 3), Itala Game Reserve in Natal (Table 5), and Pilanesberg National Park (population 85).

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Still occurs locally in rocky terrain throughout its former range in the western, northern and eastern Transvaal, a limited area of the central and eastern Orange Free State, the higher slopes of the Drakensberg (above 2500 m) and a few other areas in Natal, and the west, northwest, Orange River Valley, and southern coastal mountains of the Cape Province. Fairly common in suitable habitat and persists in many settled areas. Population unknown, but probably stable.

Status: Satisfactory.

Conservation Measures Taken: Occurs in small to moderate numbers in four national parks (Table 2), and in provincial reserves in the Transvaal (Table 3; also present in Happy Rest, Hans Strijdom Dam and Ohrigstad Dam Nature Reserves), Natal (Table 5), and the Cape Province (Table 6; also occurs in Salmonsdam, Vrolijkheid, Gamka Mountain, Gamkapoort, Akkerendam, Hottentot-Hollands and many smaller nature reserves not included in Fig. 6, and in other protected areas such as the Boosmansbos and Cederberg Wilderness Areas). Klipspringer are also present in some conservation areas in the Black States, e.g., Pilanesberg National Park, Potlake Nature Reserve and Tsolwana Game Park.

Oribi (*Ourebia ourebi*)

Distribution & Population: This species has always had a patchy distribution within South Africa in historical times. It has been recorded from open grasslands in parts of the northeastern and eastern Transvaal, the northeastern and southern Orange Free State, northwestern, central and southern Natal, and the eastern Cape. It has disappeared from many areas in which it formerly occurred. In the Transvaal it is now rare and is restricted mainly to the eastern highveld and escarpment, in the Orange Free State it is rare (population about 100 in 1985–86), in Natal it still occurs widely in open grasslands in the interior of the province but has recently disappeared from 25% of the farms where it previously occurred, and in the eastern Cape it has been reduced to scattered remnant populations. Total numbers may not exceed a few thousand and are probably declining.

Status: Vulnerable. Not very well represented within conservation areas, and threatened elsewhere by the destruction of its grassland habitat by agricultural development and changing patterns of land use.

Conservation Measures Taken: There are a few oribi within conservation areas. It occurs in small numbers in two national parks (Table 2) and several provincial reserves in the Transvaal and Natal. The species died out within Kruger National Park, and attempts to reintroduce it have so far failed to re-establish a natural population; small numbers survive within a large, fenced, predator-proof enclosure. The small population within Golden Gate Highlands National Park in the Orange Free State is at the ecological carrying capacity of the limited area of suitable habitat within this park. Similar small, stable populations occur in several Transvaal provincial nature reserves (Table 3; also occurs in Verloren Vallei Nature Reserve (population 63) and two other nature reserves not shown in Fig. 3—only the Verloren Vallei population is increasing). A relatively large protected population occurs in Natal's Giant's Castle Game Reserve (Table 5), and the species is also present in Kamberg and several other protected areas in Natal.

Conservation Measures Proposed: The oribi's immediate survival within South Africa is not threatened, but the establishment of additional conservation areas with sufficient optimal habitat to support substantial populations (e.g., several hundred individuals) may be necessary to ensure its long-term survival.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Formerly occurred almost throughout South Africa wherever there was suitable habitat, and remains widespread and very common. Numbers unknown, but stable.

Status: Satisfactory.

Conservation Measures Taken: There are major populations in Kruger (probably several thousand) and Kalahari Gemsbok National Parks, and steenbok also occur in several other national parks (Table 2). It is well represented in most nature reserves in the Transvaal (Table 3; present in many additional reserves, such as Hans Strijdom Dam, Verloren Vallei, Wolwespruit and Van Riebeeck Nature Reserves), the Orange Free State (Table 4), the Cape Province (Table 6; also occurs in Salmonsdam, Gamka Mountain, Gamkapoort, Akkerendam, Cape of Good Hope, Table Mountain, Noukloof and other nature reserves not included in Fig. 6, and in Cederberg Wilderness Area), and the Black States (e.g., Pilanesberg National Park, Potlake Nature Reserve and Tsolwana Game Park). It has a more restricted distribution in Natal, where it occurs mainly in the northern drier parts of the province and is present in small to moderate numbers in several reserves (Table 5; occurs in some other protected areas, such as Weenen Nature Reserve).

Cape Grysbok (*Raphicerus melanotis*)

Distribution & Population: This species is endemic to the southwestern and southern Cape Province, where it remains widespread and locally common within its historical range. Numbers unknown, but probably stable.

Status: Satisfactory.

Conservation Measures Taken: Occurs widely in small to moderate numbers in conservation areas within its geographical range, including four national parks (Table 2) and numerous nature reserves (Table 6; also occurs in Salmonsdam, Gamka Mountain, Keurbooms River, Cape of Good Hope, Table Mountain, and various smaller provincial and local authority nature reserves

which are not shown in Fig. 6, plus Hottentot-Hollands Nature Reserve, and Groendal, Boosmansbos and Cederberg Wilderness Areas).

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: Within the Republic of South Africa, Sharpe's grysbok is confined to the bushveld and lowveld of the northern and eastern Transvaal, where it is patchily distributed but is not uncommon where it occurs. Numbers unknown but believed to be stable.

Status: Satisfactory. Although the South African population of this species is not large, its survival within the country is not threatened. It was classed as rare by Skinner et al. (1977).

Conservation Measures Taken: Occurs in the northern and central districts of Kruger National Park (Table 2), where the population is probably at least several hundred. It is present in small to moderate numbers within four Transvaal provincial nature reserves (Table 3; also occurs in Hans Strijdom Dam Nature Reserve, where it is common).

Suni (*Neotragus moschatus*)

Distribution & Population: Occurs locally in coastal Natal/KwaZulu from the Lake St. Lucia area northwards, and marginally in the northeastern and southeastern Transvaal. Total numbers unknown. Although good populations occur in parts of Natal and KwaZulu, numbers are probably declining outside protected areas and are suppressed within some conservation areas by habitat reduction caused by large numbers of nyala. The very small Transvaal population may be stable.

Status: Vulnerable. Threatened by habitat destruction and uncontrolled hunting with dogs.

Conservation Measures Taken: Population estimates by Lawson (1986) indicate that the largest protected population (>3000) is in KwaZulu's Tembe Elephant Reserve, with major populations in Mkuzi and Ndumu Game Reserves (Table 5) and a much smaller population (perhaps 350) in False Bay Park. Very small numbers of suni occur within limited areas of suitable habitat in the northern district of Kruger National Park (Table 2) and in Transvaal's Pongola Nature Reserve (Table 3).

Conservation Measures Proposed: Recommendations by Lawson (1986) include a southward extension of Tembe Elephant Reserve to include an additional area of prime suni habitat (sand forest), formation of management plans by the KwaZulu Bureau of Natural Resources which make clear provision for suni conservation (e.g., vegetation monitoring in Tembe to detect possible detrimental habitat changes that could be caused by other browsing antelopes and elephant if their numbers increase to high levels), and active management by the Natal Parks Board within Mkuzi Game Reserve to benefit suni (e.g., intensified culling of nyala in sensitive thicket and forest areas).

Impala (*Aepyceros melampus*)

Distribution & Population: The impala's historical range included the bushveld and lowveld of the northern and eastern Transvaal, parts of the northeastern Cape and northern Natal. It was eliminated from many areas, but through reintroduction is again widespread and abundant throughout much of its original South African range. It has been introduced widely to other parts of the country, e.g., to many areas of Natal, and is one of the three major commercial game species in the Republic. There were about 350 000 on farmland in 1971 and numbers have increased substantially since then. In addition, several hundred thousand occur in conservation areas.

Status: Satisfactory.

Conservation Measures Taken: It is abundant in Kruger National Park (Table 2), with substantial populations in many reserves in the Transvaal (Table 3; also occurs in Klaserie (population about 10 000), Timbavati (15–20 000), and Sabi Sand (10–20 000) Private Nature Reserves, Wolwespruit and Pietersberg Nature Reserves, and Krugersdorp Game Reserve), the Orange Free State (Table 4), northern Natal (Table 5; also occurs in False Bay Park), and the Black States (e.g., Pilanesberg (population 1000) and Nwanedi National Parks, Potlake Nature Reserve).

Springbok (*Antidorcas marsupialis*)

Distribution & Population: Formerly occurred widely in the Cape Province, the Orange Free State and the southern Transvaal, often in enormous herds. It was exterminated in much of its natural range, but has subsequently been reintroduced to many areas. Introductions to regions where springbok did not occur naturally have often been unsuccessful, e.g., the tick-borne disease heartwater has limited introductions to the Transvaal bushveld. Together with blesbok and impala, the springbok is one of the country's three major commercial game species. The total population on farms was 269 000 in 1971 and is now considerably greater, e.g., the population in the Orange Free State increased from 43 200 in 1970–71 to 90 000 in 1985–86. Total numbers within conservation areas currently exceed 15 000.

Status: Satisfactory.

Conservation Measures Taken: The largest protected populations occur in Kalahari Gemsbok National Park (Table 2), where a large part of the population (4–5000) is permanently resident, Oviston Nature Reserve (Table 6), Tussen-die-Riviere Game Farm and Verwoerd Dam Nature Reserve (Table 4). The reintroduced population in Karoo National Park is increasing rapidly, and springbok occur in four additional national parks (Table 2). This species is well represented in several reserves in the Transvaal (Table 3; also occurs in Abe Bailey (population 260), Boskop Dam (300), Wolwespruit (100) and various other nature reserves, e.g., Faan Meintjes and Van Riebeeck), and is the most numerous antelope in Orange Free State nature reserves (Table 4). Springbok occur in most of the larger nature reserves in the Cape Province (Table 6; also occurs in Salmonsdam, Vrolijkheid, Akkerendam, Cape of Good Hope and Noukloof), and in a few conservation areas in Natal (e.g., Mount Currie Nature Reserve) and the Black States (e.g., Tsolwana Game Park, Pilanesberg National Park (population 65)).

Grey Rhebok (*Pelea capreolus*)

Distribution & Population: Naturally occurring populations of this endemic antelope still occur widely through most of its historical range, including much of the Cape Province (except for the north), eastern parts of the Orange Free State (population 1500 in 1985–86), the Natal Drakensberg, and parts of the central and southern Transvaal (mainly along the escarpment). It is not uncommon locally on rocky hills, grassy mountain slopes and plateaux. Total numbers unknown but probably stable.

Status: Satisfactory. Although it does not occur in large numbers, it remains widespread in suitable habitat.

Conservation Measures Taken: Small to moderate numbers of grey rhebok occur in three national parks (Table 2; increasing in Karoo National Park, population in Bontebok National Park controlled by capturing surplus animals for translocation, and numbers stable in Golden Gate Highlands National Park), and reserves in the Transvaal (Table 3; also present in a few other nature reserves, such as Ohrigstad Dam and Verloren Vallei), Natal (Table 5; also occurs in several nature reserves, e.g., Kamberg, Loteni, Mount Currie, Mzimkulwana and Vergelegen), the Cape Province (Table 6; occurs in various additional protected areas, such as Salmonsdam, Gamka Mountain, Gamkapoort, Cape of Good Hope, Fernkloof and Hottentots-Holland Nature Reserves, and

Groendal, Boosmansbos and Cederberg Wilderness Areas), and the Black States (e.g., Tsolwana Game Park).

References

Botha, J. 1985. Reintroduction of Lichtenstein's hartebeest to South Africa. *African Wildlife 39*(3): 111–112.

Bothma, J. du P.; Rabie, M.A. 1983. Wild animals. *In* Fuggle, R.F.; Rabie, M.A. (Editors). Environmental concerns in South Africa, pp. 190–236. Cape Town, Juta.

Crawford, R.J.M.; Robinson, G.A. 1984. History of the blue duiker *Cephalophus monticola* population in the Tsitsikamma Forests, Republic of South Africa. *Koedoe 27:* 61–71.

Greig, J. Comrie. 1979. Principles of genetic conservation in relation to wildlife management in southern Africa. *South African Journal of Wildlife Research 9:* 57–78.

Hall-Martin, A.J. 1984. Symposium on the Kalahari ecosystem—summary and conclusions. Supplement to *Koedoe* 1984: 327–333.

Hanks, J. 1979. A struggle for survival. London, Country Life Books.

Howard, P.C. 1984a. The reedbuck problem in Natal. *African Wildlife 38*(6): 250–253.

Howard, P.C. 1984b. Rationalising the translocation of reedbuck. *Lammergeyer 32:* 25–34.

Howard, P.C.; Marchant, A.N. 1984. The distribution and status of some large mammals on private land in Natal. *Lammergeyer 34:* 1–58.

Joubert, S.C.J. 1974. The social organisation of the roan antelope, *Hippotragus equinus* and its influence on the spatial distribution of herds in the Kruger National Park. *In* Geist, V.; Walther, F. (Editors). The behaviour of ungulates and its relation to management, pp. 661–675. Morges, IUCN.

Joubert, S.C.J. 1986a. The Kruger National Park—an introduction. *Koedoe 29:* 1–11.

Joubert, S.C.J. 1986b. Pollution of the Kruger National Park rivers. *African Wildlife 40*(1): 29–30.

Lawson, D. 1986. Unpublished Ph.D. thesis, Institute of Natural Resources, University of Natal, Pietermaritzburg.

Mills, M.G.L.; Retief, P.F. 1984. The effect of windmill closure on the movement patterns of ungulates along the Auob riverbed. Supplement to *Koedoe* 1984: 107–118.

Penzhorn, B.L. 1985. An old reference to 'hartebeest' in the Transvaal lowveld. *Koedoe 28:* 69–71.

Pienaar, U. de V. 1963. The large mammals of the Kruger National Park—their distribution and present-day status. *Koedoe 6:* 1–37.

Pienaar, U. de V. 1969. Predator-prey relationships among the larger mammals of the Kruger National Park. *Koedoe 12:* 108–176.

Pienaar, U. de V. 1985. Indications of progressive desiccation of the Transvaal lowveld over the past 100 years, and implications for the water stabilization programme in the Kruger National Park. *Koedoe 28:* 93–165.

Skinner, J.D.; Fairall, N.; Bothma, J. du P. 1977. South African red data book—large mammals. South African National Scientific Programmes Report No. 18.

Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.

Smuts, G.L. 1978. Interrelations between predators, prey, and their environment. *Bioscience 28:* 316–320.

Van der Walt, P.T.; Retief, P.F.; Le Riche, E.A.N.; Mills, M.G.L.; Graaff, G. de. 1984. Features of habitat selection by larger herbivorous mammals and the ostrich in the southern Kalahari conservation areas. Supplement to *Koedoe* 1984: 119–128.

Venter, J. 1979. Quantity not quality? *African Wildlife 33*(1): 30–32.

Chapter 11: Swaziland

J.L. Anderson

Introduction

Swaziland is a small, relatively densely populated country, bordered by the Republic of South Africa on three sides and by Mozambique on its eastern boundary. Despite its small size (17 363 sq km), it has a wide variety of topography and climate. Altitude ranges from >1800 m in the northwest to <50 m in parts of the east. Swaziland is traversed by a network of river systems, and consequently has good water resources. Mean annual rainfall exceeds 1500 mm in parts of the mountainous northwest, but is <750 mm in much of the eastern half of the country.

There are four main natural regions (Fig. 1). The highveld is mostly above 1200 m in altitude and comprises mountainous terrain and open, grassy plateaux dissected by deep, rocky valleys. The broad, rolling plains of the middleveld vary in altitude from 330 to 1070 m (mean altitude 600 m). The lowveld slopes from 360 m in altitude in the west to <100 m in the east. On its eastern edge, the Lebombo uplands rise abruptly across a 450 m escarpment to altitudes of up to 6–800 m, separating the lowveld from the coastal plain of Mozambique. The natural vegetation of the lowveld and the Lebombo uplands is savanna grassland.

These natural habitats formerly supported a wide variety of antelopes and other wildlife. Hunting pressure and the expansion of agriculture have severely depleted Swaziland's wildlife, but the Government has actively supported the development of an effective conservation programme over the last two decades. There are now several well-protected conservation areas. These are under the control of the Swaziland National Trust, which was established in 1972 to oversee the preservation of the country's heritage, including nature conservation. Most of the larger antelopes now survive only within protected areas, although naturally occuring kudu and waterbuck (as well as grey duiker, impala and steenbok) occur on some of the larger commercially owned cattle ranches.

Current Status of Antelopes

Swaziland's antelope fauna is exceptionally diverse for such a small country, comprising 26 species (Table 1) which range from typical species of the southern African highveld, such as black wildebeest and blesbok, to lowveld species such as nyala and waterbuck. Not all of the antelopes listed in Table 1 may have occurred naturally within Swaziland, and several species have been reintroduced from South Africa after becoming locally extinct. The current satisfactory status of more than half of the species which still occur (Table 1) is a direct result of the establishment of effectively protected conservation areas over the last 20–30 years. Most of the species which are classed as vulnerable or endangered have very limited areas of available habitat remaining in Swaziland.

Conservation Measures Taken

Five conservation areas containing antelopes have been established, including representative examples of the country's four

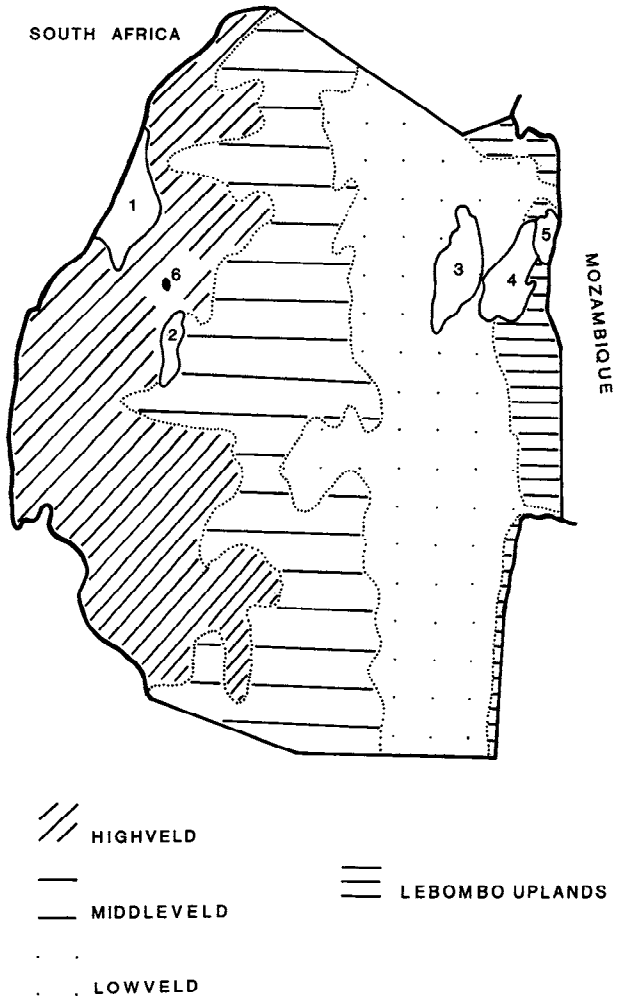

Fig. 1. Natural regions (after Murdoch 1968) and conservation areas of Swaziland. 1: Malolotja Nature Reserve (180 sq km). 2: Mlilwane Wildlife Sanctuary (45 sq km). 3: Hlane Game Reserve (163 sq km). 4: Mlawula Nature Reserve (120 sq km). 5: Ndzindza Nature Reserve (55 sq km). 6: Mbabane.

main natural regions (Fig. 1). Mlilwane Wildlife Sanctuary, which includes both middleveld and highveld (altitude 685–1460 m), was the first conservation area established in Swaziland. It was founded in the early 1960s by Mr. T.E. Reilly from the family farm which he inherited, south of Mbabane. Zebra (*Equus burchelli*), blue wildebeest and impala were translocated to Mlilwane from other areas of the country, where they were in danger of extinction. Subsequently, other species of large mammals were reintroduced from South Africa, and this sanctuary now has the country's largest variety of wildlife. The development of Mlilwane and the subsequent expanion of Swaziland's nature conservation programme were strongly supported by the late King Sobhuza II.

Malolotja Nature Reserve in a scenically spectacular area of the northwestern highveld supports indigenous populations of bushbuck and oribi, and several introduced/reintroduced antelope species, such as black wildebeest, red hartebeest and blesbok. Hlane Game Reserve in the northern lowveld is in the area which historically supported the densest population of wild ungulates recorded in Swaziland. Hlane, which had been a royal game reserve since the 1940s, was proclaimed a game sanctuary by the king in 1967. Establishment of an effective ranger force brought poaching under control and allowed the wildlife populations to build up to high levels, until parts of the reserve were badly overgrazed by the late 1970s. Hlane has also suffered from construction of a highway through its centre, but it retains the country's largest wildlife populations. Blue wildebeest and impala are the most numerous species.

Table 1
Current Status of Antelopes in Swaziland

Species	Status*	Species	Status
Bushbuck	S	Red Hartebeest	S
Nyala	S	Lichtenstein's Hartebeest	Ex
Greater Kudu	S	Blesbok	S
Common Eland	S	Tsessebe	R
Blue Duiker	I	Klipspringer	En
Natal Red Duiker	S	Oribi	En
Grey Duiker	S	Steenbok	S
Waterbuck	V	Sharpe's Grysbok	K
Southern Reedbuck	V	Suni	Ex
Mountain Reedbuck	V	Impala	S
Roan	Ex	Springbok	Ex
Sable	R	Grey Rhebok	En
Black Wildebeest	S		
Blue Wildebeest	S		

* Ex = extinct; En = endangered; R = rare; V = vulnerable; I = indeterminate (i.c., endangered, rare, or vulnerable); K = insufficiently known; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

Mlawula Nature Reserve extends from lowveld immediately east of Hlane Game Reserve to the Lebombo uplands. Its wildlife includes several antelope species and more may be reintroduced. The contiguous Ndzindza Nature Reserve is located on the crest of the Lebombo Mountains.

A vital aspect of Swaziland's conservation efforts is the National Environmental Education Programme. This programme, which is based at Mlilwane Sanctuary and directed by its founder, Mr. T.E. Reilly, is funded by the Swaziland National Trust Commission and United States aid (Cindzi & Ellis 1986). The programme aims to increase environmental awareness among all of Swaziland's people, to ensure the conservation of the Kingdom's natural resources.

Conservation Measures Proposed

Maintenance of the current high standards of protection in Swaziland's existing conservation areas will provide for the long-term survival of representative examples of the country's antelope fauna. This will be an outstanding conservation achievement for a small developing country with a rapidly increasing human population. Continuation and reinforcement of attempts to increase public awareness of the importance of nature conservation, such as the National Environmental Education Programme, will undoubtedly play a key role in determining the long-term success of conservation in Swaziland.

Species Accounts

This section briefly reviews the current distribution, population and status of each species in Swaziland. Smithers (1983) provides an overview of the habitat, food preferences, and reproduction of southern African antelopes.

Bushbuck (*Tragelaphus scriptus*)

Distribution & Population: This species' historical range probably included most of Swaziland, apart from the open grasslands of the western highveld (Smithers 1983). It still occurs locally outside conservation areas, where there is sufficient cover and the pressures of hunting with dogs and snares are not severe. It is common within suitable habitat in Mlilwane Wildlife Sanctuary, Hlane Game Reserve, Malolotja and Mlawula/Ndzindza Nature Reserves.

Status: Satisfactory (not threatened).

Nyala (*Tragelaphus angasii*)

Distribution & Population: Formerly occurred in the lowveld but died out within Swaziland, probably because of the combined effects of rinderpest and hunting. It has been reintroduced to conservation areas and some cattle ranches, and is now locally common in Hlane Game Reserve.

Status: Satisfactory.

Greater Kudu (*Tragelaphus strepsiceros*)

Distribution & Population: The kudu was historically found throughout most of the lowveld, middleveld, and Lebombo uplands of Swaziland. It still occurs locally within this range, persisting in some of the less densely settled areas where sufficient natural cover remains. Well represented in Mlilwane Wildlife Sanctuary, Hlane Game Reserve, and Mlawula/Ndzindza Nature Reserves.

Status: Satisfactory.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: This species was extinct in Swaziland until it was reintroduced in the 1960s to Mlilwane Wildlife Sanctuary, where it is now well established.

Status: Satisfactory.

Blue Duiker (*Cephalophus monticola*)

Distribution & Population: It is possible that this duiker occurs/formerly occurred in Swaziland. It was included in Swaziland's antelope fauna by Bothma (1975), based on information provided by T.E. Reilly.

Status: If it does exist in Swaziland, its status is highly precarious. It was classed as either extinct or threatened with extinction in Swaziland by Bothma (1975).

Natal Red Duiker (*Cephalophus natalensis*)

Distribution & Population: Probably occurred widely within suitable habitat, such as riverine forests and wooded mountain slopes, in the lowveld and Lebombo uplands, but much of its habitat has now been destroyed. Numbers are probably continuing to decline outside protected areas, but its populations are stable within conservation areas. Common in Mlawula Nature Reserve.

Status: Satisfactory.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Despite extensive habitat modification and widespread hunting, this remarkably adaptable species persists locally within its former range, which extended throughout much of the country. It occurs in Mlilwane Wildlife Sanctuary, Hlane Game Reserve, and Mlawula/Ndzindza Nature Reserves.

Status: Satisfactory.

Waterbuck (*Kobus ellipsiprymnus ellipsiprymnus*)

Distribution & Population: Like most large antelopes, the waterbuck is now extinct or close to extinction in most parts of Swaziland outside protected areas, although it still occurs naturally on some cattle ranches. It occurs in small numbers in Mlilwane Wildlife Sanctuary (reintroduced) and Hlane Game Reserve, where it moved in naturally following the establishment of this reserve in the late 1960s.

Status: Vulnerable.

Southern Reedbuck (*Redunca arundinum*)

Distribution & Population: Historically, this reedbuck occurred widely within suitable habitat in Swaziland, but it has been reduced to a few scattered remnants by hunting and the expansion of human settlement. There is a small population in Mlilwane Wildlife Sanctuary.

Status: Vulnerable.

Mountain Reedbuck (*Redunca fulvorufula*)

Distribution & Population: Formerly occurred locally on grassy hillsides with some bush or tree cover, mainly in the Lebombo uplands. Now reduced to small remnant populations.

Status: Vulnerable.

Roan (*Hippotragus equinus*)

Distribution & Status: Swaziland was formerly the southern limit of this species' continental distribution. The last known specimen was found in a snare in 1961. It is now extinct in Swaziland. It was planned to re-introduce roan from Namibia in 1987.

Sable (*Hippotragus niger*)

Distribution & Population: The sable antelope was formerly widespread in the eastern Transvaal lowveld, but it is not known if the species' natural range extended as far south as Swaziland. The only sable in the country at present are six animals in an introduced population in Mlilwane Wildlife Sanctuary.

Status: Rare.

Black Wildebeest (*Connochaetes gnou*)

Distribution & Population: The black wildebeest's historical range extended into the highveld of western Swaziland, where it was extinct until it was reintroduced to Malolotja Nature Reserve in the 1970s. This reintroduced population is thriving and is now secure.

Status: Satisfactory.

Blue Wildebeest (*Connochaetes taurinus taurinus*)

Distribution & Population: Probably widespread in the lowveld at one time, but now confined to conservation areas. It has responded particularly well to the effective control of poaching in Hlane Game Reserve, where numbers increased from a few hundred in 1967 to several thousand by the late 1970s. Blue wildebeest have been reintroduced to Mlilwane Wildlife Sanctuary, and introduced to Malolotja Nature Reserve which may be outside the species' natural range.

Status: Satisfactory.

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Population: Swaziland is probably outside this hartebeest's historical range, although it formerly occurred widely in the highveld of the Transvaal and extended into western Natal. An introduced population has become well established in Malolotja Nature Reserve.

Status: Satisfactory.

Lichtenstein's Hartebeest (*Alcelaphus lichtensteinii*)

Distribution & Status: Lichtenstein's hartebeest probably occurred historically on the Pongola River in the southeastern Transvaal and northern Natal, just to the south of Swaziland (Smithers 1983). Its range may have extended into the southern parts of the country. It has been extinct in this region since the early 1900s.

Blesbok (*Damaliscus dorcas phillipsi*)

Distribution & Population: Formerly abundant throughout the southern African highveld, the blesbok was exterminated in Swaziland. It has been reintroduced to Malolotja Nature Reserve and Mlilwane Wildlife Sanctuary, where good populations now occur.

Status: Satisfactory.

Tsessebe (*Damaliscus lunatus lunatus*)

Distribution & Population: Occurred historically in parts of the lowveld, where it died out. There is a small reintroduced population in Hlane Game Reserve.

Status: Rare.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Population: Formerly occurred locally in parts of the Lebombo uplands, where very small numbers are still present.

Status: Endangered.

Oribi (*Ourebia ourebi*)

Distribution & Population: The oribi has a limited distribution in Swaziland. It occurs in very small populations in Malolotja and Mlawula Nature Reserves, and in low numbers elsewhere. It is threatened by habitat destruction outside protected areas.

Status: Endangered, in view of its small numbers and the threatened loss of much of its remaining habitat to agriculture.

Steenbok (*Raphicerus campestris*)

Distribution & Population: Historically, the steenbok was found throughout much of Swaziland, and it is one of the few antelope species which still occurs in significant numbers outside protected areas. It is well represented in Mlilwane Wildlife Sanctuary and Hlane Game Reserve.

Status: Satisfactory.

Sharpe's Grysbok (*Raphicerus sharpei*)

Distribution & Population: This species reaches the southern limits of its continental distribution in eastern Swaziland and adjacent southern Mozambique (Smithers 1983). It appears to have a limited distribution in Swaziland. Occasional sightings are reported in the east.

Status: There is insufficient information to assess this species' status.

Suni (*Neotragus moschatus*)

Distribution & Status: The suni probably occurred formerly in eastern Swaziland. It still occurs in parts of adjacent Mozambique and the Transvaal, but is extinct in Swaziland (Bothma 1975).

Impala (*Aepyceros melampus*)

Distribution & Population: Formerly occurred widely in the lowveld, middleveld and Lebombo uplands. Now survives only in conservation areas and on some commercially owned cattle ranches. It is abundant in Hlane Game Reserve (population several thousand), and has been reintroduced to Mlilwane Wildlife Sanctuary and Mlawula Nature Reserve. It has also been introduced to Malolotja Nature Reserve (which is probably outside the species' natural range) by translocation of surplus animals from Hlane.

Status: Satisfactory.

Springbok (*Antidorcas marsupialis*)

Distribution & Status: Swaziland is very marginal or possibly extralimital to the springbok's historical distribution. It was introduced to Mlilwane Wildlife Sanctuary, but all of the introduced animals succumbed to "heartwater."

Grey Rhebok (*Pelea capreolus*)

Distribution & Population: The grey rhebok's historical range included the highveld of western Swaziland, where it still occurs locally in very low numbers.

Status: Endangered. Although its population is currently stable, it may be too small to be viable.

Acknowledgment

Information on the current status of antelopes in Swaziland was provided by T.E. Reilly.

References

Bothma, J. du P. 1975. Conservation status of the larger mammals of southern Africa. *Biological Conservation 7:* 87–95.

Cindzi, I.; Ellis, S. 1986. Swaziland: Peace Corps Swaziland environmental education/parks projects. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 631–639. Washington DC, US Peace Corps.

Murdoch, G. 1968. Soils and land capability in Swaziland. Swaziland Ministry of Agriculture Bulletins Nos. 23–25, Mbabane.

Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.

Chapter 12: Lesotho

J.L. Anderson

Introduction

Lesotho is a small, mountainous enclave (altitude 1250 to >3000 m) of 30 350 sq km, surrounded by the Republic of South Africa (Fig. 1). The Drakensberg Mountains form the eastern boundary, and more than 80% of the country is mountainous. There are extensive plains and broad valleys in the west. Mean annual rainfall varies from <800 mm in the west to >1000 mm in the northeast.

The natural vegetation of Lesotho was largely open grassland, with thickets and bush in the valley bottoms and some patches of forest (now destroyed). Much of the veld has been degraded severely because of the demands of the human population on the environment. Population density is high (average >45 persons per sq km; locally much greater) and increasing. Soil erosion and the invasion of overgrazed areas by scrub are major problems.

Current Status of Antelopes

Lesotho includes the southeastern part of the highveld which covers the Orange Free State and the southern Transvaal within the Republic of South Africa. Historically, the antelope fauna probably included typical highveld species, such as black wildebeest, red hartebeest, blesbok, eland and grey rhebok. Uncontrolled hunting had wiped out almost all of the country's larger

Table 1
Current status of Antelopes in Lesotho

Species	Status*	Species	Status
Bushbuck	K	Red Hartebeest	Ex
Common Eland	I	Blesbok	R
Blue Duiker	Ex	Klipspringer	K
Grey Duiker	En	Oribi	I
Southern Reedbuck	Ex	Springbok	Ex
Mountain Reedbuck	I	Grey Rhebok	S
Black Wildebeest	R		

* Ex = extinct; En = endangered; R = rare; I = indeterminate (i.e., endangered, rare, or vulnerable); K = insufficiently known; S = satisfactory (not threatened). See chapter 1 for definition of status categories.

mammals by 1900, and very little wildlife remains today. Some antelope species still occur in small numbers (Table 1).

Conservation Measures Taken

Lesotho has one major conservation area, Sehlabathebe National Park, which is situated on open, hilly grassveld in the Drakensberg (Fig. 1). This park's chief attraction is its outstanding scenery, but it contains some wildlife including a few antelope species. The park was fenced (with World Wildlife Fund support) in 1972–74 to exclude domestic livestock, apart from a 1 km stretch on the South African border which was left unfenced to allow for seasonal movements of wildlife to and from the Natal Drakensberg. Exclusion of livestock has allowed the veld of Sehlabathebe to recover substantially from previous heavy grazing (Anon. 1986).

Conservation Measures Proposed

Agricultural land is at a premium in Lesotho, and there is little more that can be done to conserve what remains of the country's antelope fauna. It may be possible to establish an additional protected area of montane habitat. The recovery of the vegetation of Sehlabathebe National Park which has occurred since the boundary fence was erected may enable further antelope species to be reintroduced in future.

Species Accounts

Bushbuck (*Tragelaphus scriptus*)

Distribution & Status: This species probably occurred in riverine thickets, but much of this habitat has now been destroyed in Lesotho. If the species survives, it is undoubtedly very rare.

Common Eland (*Tragelaphus oryx*)

Distribution & Population: Eland are no longer permanently resident in Lesotho, but small numbers visit from the adjacent reserves of the Natal Drakensberg. It is a seasonal visitor to Sehlabathebe National Park.

Status: Animals from the substantial eland population in adjacent Natal will probably continue to move into Lesotho.

Blue Duiker (*Cephalophus monticola*)

Distribution & Status: The blue duiker may have occurred in the lower-lying forests, which have been destroyed for firewood. If it did formerly occur, this duiker is now extinct in Lesotho.

Grey Duiker (*Sylvicapra grimmia*)

Distribution & Population: Probably occurred widely in Lesotho in historical times. Like the rest of the country's wildlife, it has suffered severely from heavy hunting pressure. A few may still survive in some of the lower-lying areas.

Status: Endangered (possibly already extinct).

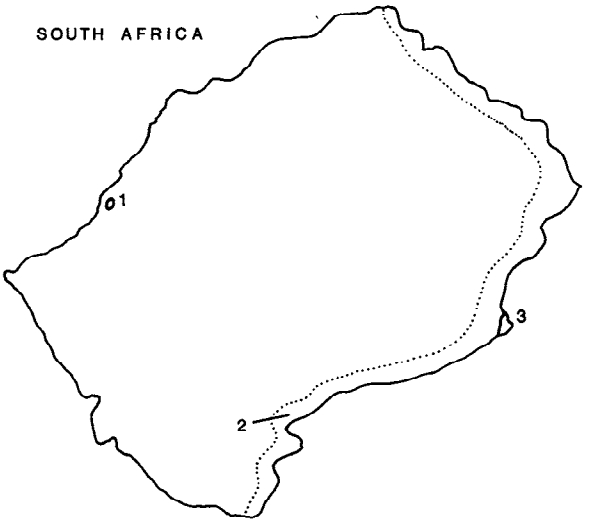

Fig. 1. Lesotho. 1: Maseru. 2: Drakensberg Mountains. 3: Sehlabathebe National Park (65 sq km).

Southern Reedbuck (*Redunca arundinum*)

Distribution & Status: This reedbuck probably occurred in the lower-lying wetlands, but it has been exterminated by habitat destruction and hunting.

Mountain Reedbuck (*Redunca fulvorufula*)

Distribution & Population: Mountain reedbuck may have formerly occurred widely within suitable habitat in Lesotho's uplands, but now occur in only two districts (Anon. 1986).

Status: Indeterminate. Likely to become extinct eventually, unless a viable protected population can be established.

Black Wildebeest (*Connochaetes gnou*)

Distribution & Population: Probably occurred formerly, at least in the western parts of the country, but it was exterminated before 1900. Small numbers have been reintroduced to Sehlabathebe National Park.

Status: Rare.

Red Hartebeest (*Alcelaphus buselaphus caama*)

Distribution & Status: May have occurred prior to 1900, but it has been extinct in Lesotho this century.

Blesbok (*Damaliscus dorcas phillipsi*)

Distribution & Population: Formerly occurred in western Lesotho (Smithers 1983), but it was exterminated last century. A small number of blesbok have been reintroduced recently.

Status: Rare.

Klipspringer (*Oreotragus oreotragus*)

Distribution & Status: This species probably occurred historically on rocky mountain sides. It is found in small to moderate numbers in adjacent parts of the Orange Free State and Natal, and may still occur in Lesotho.

Oribi (*Ourebia ourebi*)

Distribution & Population: May have been widespread in eastern Lesotho in former times, but it now occurs largely or entirely

as a seasonal visitor from the Natal Drakensberg. It occurs in Sehlabathebe National Park.

Status: The oribi's continued occurrence in Lesotho may depend on the dispersal of animals from Natal.

Springbok (*Antidorcas marsupialis*)

Distribution & Status: The springbok was probably a seasonal visitor to the lower-lying areas of the country. If so, it was exterminated before 1900.

Grey Rhebok (*Pelea capreolus*)

Distribution & Population: This species probably occurred widely on Lesotho's rocky slopes and plateau grasslands (Smithers 1983), but it is now reduced to a few scattered remnants. It occurs in Sehlabathebe National Park, where numbers have increased from about 12 when the park was fenced in the early 1970s to almost 200 (Anon. 1986).

Status: Satisfactory, in view of its favourable response to protection in Sehlabathebe.

References

Anonymous. 1986. Lesotho: Peace Corps Lesotho national park project. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 641–646. Washington DC, US Peace Corps.

Smithers, R.H.N. 1983. The mammals of the southern African subregion. Pretoria, University of Pretoria.

SECTION 3: STATUS SUMMARY & REGIONAL ACTION PLAN

Chapter 13: Summary of Regional Status of Antelopes in Southern and South-Central Africa

R. East

Introduction

The individual country accounts (section 2) have summarised what is known about the status of antelopes in each country and outlined conservation priorities. This chapter takes a regional overview of the status of antelopes and identifies key species and subspecies which are currently/potentially at risk within the region.

Criteria for Assessment of Regional Status of Species

The conservation status of antelopes has been assessed according to Red Data Book categories in the reports on individual countries. These categories, which are defined in chapter 1, provide a useful qualitative overview of the status of antelopes within countries, but difficulties arise in applying them between countries. The distinction between "not threatened" and "vulnerable" or "rare," for example, depends partly on a subjective interpretation of what comprises a "small" population. This may be several thousand individuals in a large country with an abundant antelope fauna, and a few hundred or less in a small, densely populated country with much smaller wildlife populations. These difficulties can only be overcome by defining status categories according to quantitative criteria.

The criteria defined in Table 1 are therefore used to assess the regional conservation status of antelopes (East 1988). These quantitative regional status categories are italicised to distinguish them from the qualitative Red Data Book categories defined in chapter 1 (apart from "extinct," which has an identical definition in each system).

Regional Status of Species and Subspecies

The current status of antelope species in Southern and South-central Africa (treating all 10 countries as a regional unit) is assessed in Table 2, using the criteria in Table 1. Only one species, the bluebuck, is known to have become extinct within the region in historical times. Approximately 80% of the 35 extant species are classed as *not threatened/satisfactory,* with the remainder *rare* or *threatened.* The species classed as *rare* are all well represented by stable or increasing populations within conservation areas and are not at risk as long as these areas are effectively protected and managed.

All of the seven surviving species which are largely or entirely confined to the region are classed as *not threatened,* with the possible exception of black wildebeest. The increasing trend in black wildebeest numbers and the high level of protection currently afforded most of this species' existing populations should shift its regional status from *rare* to *not threatened* in the near future. Both of the species which occur marginally within Southern and South-central Africa, black-fronted and bay duikers, are classed as regionally *threatened* (Table 2), but are common elsewhere in their ranges.

Consideration of intraspecific variation is restricted to a small number of subspecies which are highly distinctive morphologically, behaviourally and/or geographically (see chapter 2). Their regional status is assessed in Table 3, using the criteria in Table 1. Seven of these subspecies are classed as *satisfactory,* one (Roberts' lechwe) is extinct, and eight are *rare, threatened* or *endangered.* The criteria used to assess regional status (Table 1) emphasize the potential vulnerability of antelopes which have very restricted distributions (East 1988). Antelopes which occur in substantial numbers but only a few discrete populations may be

Table 1
Criteria[1] Used to Define Regional Conservation Status of Antelope Species

Status	Total No./Distribution & Abundance[2]	Popns. in Cons. Areas[3]
Satisfactory/not threatened (S)	≥10 000 or Widespread, Common/Moderate Nos.	A
	Localised, Common	A
Threatened (T)	≥1000 or Widespread, Common/Moderate Nos./Few	B
	Localised, Common/Modern Nos.	B
Rare (R)	≥1000 & <10 000 or Widespread, Few	A
	Localised, Moderate Nos./Few	A
Endangered (En)	<1000 or Localised, Few	B
Extinct (Ex)	No longer occurs in the wild	–

[1] These criteria refer to antelopes whose populations are declining outside conservation areas; species which occur in large, stable or increasing populations outside conservation areas are clearly not under threat regardless of their status within conservation areas. In practice, antelopes which still occur widely in large populations outside conservation areas are also well represented within conservation areas, e.g., bushbuck, grey duiker.

[2] For species whose numbers are unknown, "localised" and "widespread" refer to their distributions within the region; "few," "moderate numbers," and "common" are qualitative assessments of their overall abundance within the areas in which they occur.

[3] Large (≥1000) stable or increasing populations known to occur in x conservation areas (including proposed conservation areas) within the region; where numbers unknown, widespread or common within x conservation areas within the region which contain extensive suitable habitat.

For species confined to the region A: $x \geq 4$; B: $x < 4$.

For species not confined to the region, A: $x \geq 1$; B: $x = 0$.

Table 2

Current Regional Status of Antelope Species in Southern and South-central Africa (see chapter 2 for scientific names and determinators)

Species	Importance of Region[1]	No. Countries[2]	Total Regional Popn.[3]	Popns. in Cons. Areas[4]	Status[5]
Bushbuck	W	9 or 10	widespread, common	A	*S*
Sitatunga	W	6	>30 000	A	*S*
Greater Kudu	W	9	>250 000	A	*S*
Nyala	C	5	>40 000	A	*S*
Common Eland	W	10	>50 000	A	*S*
Blue Duiker	W	6 or 7	localised, mod. nos.	A	*R*
Natal Red Duiker	W	5 or 6	localised, common	A	*S*
Black-fronted Duiker	M	1	localised, mod. nos.	B	*T*
Bay Duiker	M	1	localised, mod. nos.	B	*T*
Yellow-backed Duiker	W	2	localised, mod. nos.	A	*R*
Grey Duiker	W	9 or 10	widespread, common	A	*S*
Southern Reedbuck	W	9	>30 000	A	*S*
Mountain Reedbuck	W	5	>30 000	A	*S*
Waterbuck	W	9	>45 000	A	*S*
Puku	W	6	>15 000	A	*S*
Lechwe	C	4	>100 000	A	*S*
Bluebuck	C	1 (formerly)	formerly localised, mod. nos.	B	Ex
Roan	W	8	<10 000	A	*R*
Sable	W	9	>30 000	A	*S*
Gemsbok	W	5	≥200 000	A	*S*
Common Hartebeest	W	6	>75 000	A	*S*
Lichtenstein's Hartebeest	W	6	>10 000	A	*S*
Bontebok & Blesbok	C	3	>150 000	A*	*S*
Tsessebe	W	7	>15 000	A	*S*
Blue Wildebeest	W	8	>100 000	A	*S*
Black Wildebeest	C	3	about 10 000	A*	*R/S*
Impala	W	9	>600 000	A	*S*
Springbok	C	4	>600 000	A	*S*
Suni	W	4	localised, common	A	*S*
Cape Grysbok	C	1	localised, common	A*	*S*
Sharpe's Grysbok	W	7	widespread, mod. nos.	A	*S*
Steenbok	W	8	widespread, common	A	*S*
Kirk's Dikdik	W	2	localised, common	A	*S*
Oribi	W	9	>20 000	A	*S*
Klipspringer	W	9 or 10	widespread, common	A	*S*
Grey Rhebok	C	3	localised, common	A*	*S*

* Including popns. protected on private land.

[1] C = largely or entirely confined to the region; W = occurs widely outside the region, but region contains internationally significant populations; M = occurs marginally in the region.

[2] No. countries within the region in which the species currently occurs naturally (including reintroductions where the species formerly occurred naturally).

[3] Extrapolated from population estimates obtained by aerial and/or ground censuses over substantial areas of the species' range in Southern and South-central Africa (see individual country reports; estimates of total regional populations are conservative). For species whose numbers are unknown, qualitative assessments of distribution and abundance are given (see Table 1, footnote 2).

[4] See Table 1, footnote 3.

[5] Ex = extinct; *En = endangered*; *R = rare*; *T = threatened*; *S = satisfactory/not threatened*, as defined in Table 1.

classed as *threatened* although their survival is not currently at risk, e.g., red lechwe, Kafue lechwe, black lechwe, and Cookson's wildebeest (Table 3). Among the other subspecies classed as *threatened* or *endangered* in Table 3, the population of black-faced impala is increasing in Namibia where it is now effectively protected, but the giant sable and Nyassa wildebeest are in danger of extinction within the region in the short to medium term.

Key Species and Subspecies Currently or Potentially at Risk

Antelopes classed as *rare, threatened* or *endangered* are listed in Table 4. As noted above, the survival of few of these antelopes is currently at risk within the region. Most are well represented in several conservation areas (Table 4), although the status of many of these antelopes could deteriorate rapidly if wildlife conservation suffered a general decline throughout the region. The key protected areas for the conservation of individual species and subspecies listed in Table 4 also assume high international priority for the conservation of antelope communities within the region (see chapter 14), with a few exceptions such as the key areas for Kafue lechwe.

Increased conservation action is required most urgently for antelopes which are regionally *endangered* or under immediate threat of declining to *endangered* status, viz., giant sable and Nyassa wildebeest (Table 4). The Nyassa wildebeest occurs in large numbers outside the region, in southern Tanzania, but the giant sable is confined to Angola. Improvement of the conservation status of the giant sable is therefore the highest priority in the conservation of individual antelope species and subspecies within Southern and South-central Africa. The giant sable is also of major symbolic significance to antelope conservation. Because of its spectacular appearance, it is used as the symbol of wildlife conservation in Angola, and it is the emblem of the IUCN/SSC Antelope Specialist Group.

Table 3
Current Regional Status of Certain Antelope Subspecies in Southern and South-central Africa

Subspecies	Importance of Region[1]	No. Countries[2]	Total Regional Popn.[3]	Popns. in Cons. Areas[4]	Status[5]
Ringed Waterbuck (*K. ellipsiprymnus ellipsiprymnus*)	W	8	>35 000	A	*S*
Defassa Waterbuck (*K. ellipsiprymnus defassa* (incl. *crawshayi*))	W	2	>10 000	A	*S*
Red Lechwe (*K. leche leche*)	C	4	>30 000	B	*T*
Kafue Lechwe (*K. leche kafuensis*)	C	1	>40 000	B	*T*
Black Lechwe (*K. leche smithemani*)	C	1	>40 000	B	*T*
Roberts' Lechwe (*K. leche robertsi*)	C	1 (formerly)	formerly localised, common	B	Ex
Giant Sable (*H. niger variani*)	C	1	<3 000	B	*T/En*
Gemsbok (*O. gazella gazella*)	W	5	≥200 000	A	*S*
Red Hartebeest (*A. buselaphus caama*)	W	6	>75 000	A	*S*
Bontebok (*D. dorcas dorcas*)	C	1	>1500	A*	*R*
Blesbok (*D. dorcas phillipsi*)	C	3	>150 000	A*	*S*
Tsessebe (*D. lunatus lunatus*)	C	7	>15 000	A	*S*
Blue Wildebeest (*C. taurinus taurinus*)	C	8	>100 000	A	*S*
Cookson's Wildebeest (*C. taurinus cooksoni*)	C	1	about 10 000	B	*T*
Nyassa Wildebeest (*C. taurinus johnstoni*)	W	1	<500	B	*En*
Black-faced Impala (*A. melampus petersi*)	C	2	1–2000	B	*T*

* Including popns. conserved on private land.
[1,2,3,4,5] See Table 2.

Antelopes for Which More Information Is Required

The most serious gap in current knowledge of the conservation status of antelopes in Southern and South-central Africa is the lack of up to date information on the distribution, abundance and status of antelopes in Angola. The most recent information on Angola's antelopes available to the Antelope Survey dates from 1983 (see chapter 3). At present, armed conflict precludes attempts to obtain more up to date information. As soon as conditions allow, surveys of Angola's wildlife should be initiated, with particular emphasis on unique forms such as the giant sable. The objective of these surveys should be to assist Angola to rebuild an effective system of protected areas and to conserve its remaining wildlife resources.

The regional conservation status of duikers in Southern and South-central Africa, particularly forest duikers (*Cephalophus* spp.), has been determined subjectively from qualitative assessments of distribution and abundance (Table 2). The region is of major importance for three species of forest duikers, viz., blue, Natal red, and yellow-backed, of which two (blue and yellow-backed) are tentatively classed as *rare* (Table 2). Surveys are required to provide more accurate information on the distribution, abundance and conservation requirements of forest duikers throughout Africa (East 1988; Wilson 1987).

Captive Breeding

As an insurance against extinction in the wild, it would be desirable to establish secure captive breeding populations of at least the species and subspecies listed in Table 4 which are endemic to the region, especially those whose survival is most at risk. Suitable natural habitats must also be conserved or re-established to enable re-introductions to be made eventually from captive populations.

Data from ISIS (1986) indicate that European and North American zoos hold sufficient numbers of a few of these antelopes to maintain secure captive breeding populations (Table 5), providing these genetic resources are managed carefully (Franklin 1980). Additional specimens may be held in zoos elsewhere, but there are no known captive individuals of antelope such as the giant sable. Establishment of a semi-captive population of giant sable

Table 4

***Threatened, Rare* and *Endangered* Antelopes in Southern and South-central Africa. Asterisks denote antelopes classed as regionally *endangered* or likely to become *endangered* in the near future**

Species/ Subspecies	Habitat	Major Areas of Present Occurrence within Region (important conservation areas in parentheses)[1]
Species Confined to the Region:		
Black Wildebeest	Highveld grassland	South African highveld (Orange Free State & Transvaal NRs, Golden Gate Highlands NP, Mt. Zebra NP); Swaziland (Malolotja NR)
Subspecies Largely/Entirely Confined to the Region:		
Red Lechwe	Floodplain	Central and southeastern Angola (Luando R, Mavinga R, Luiana R), western Zambia (Kafue NP), Caprivi Strip of Namibia (Western Caprivi GR), northern Botswana (Moremi GR)
Kafue Lechwe	Floodplain	Kafue Flats, Zambia (Lochinvar NP, Blue Lagoon NP)
Black Lechwe	Floodplain	Bangweulu Basin, Zambia (Bangweulu GMA)
*Giant Sable	*Brachystegia* woodland	Northern Angola (Kangandala NP, Luando R)
Bontebok	Coastal plain	Southwestern Cape, South Africa (Bontebok NP, De Hoop NR, Cape of Good Hope NR)
Cookson's Wildebeest	Savanna grassland	Luangwa Valley, Zambia (North Luangwa NP, Luambe NP, South Luangwa NP)
Black-faced Impala	Mopane savanna	Northwestern Namibia (Etosha NP), southwestern Angola (Bikuar NP, Iona NP, Mupa NP)
Species Which Occur Widely Outside the Region:		
Blue Duiker	Forest & thicket	Northern Angola (Kisama NP), northern & western Zambia (West Lunga NP, Kafue NP, Nsumbu NP), Malawi (Nyika NP, FRs), central Mozambique (Gorongosa NP), eastern Zimbabwe (Chimanimani NP, Nyanga NP, Mtarazi Falls NP), eastern & southern coastal South Africa (Tsitsikamma NP, Zuurberg NP, Natal & Cape Province NRs)
Yellow-backed Duiker	Forest & thicket	Northern & western Zambia (Kafue NP, West Lunga NP), northern Angola
Roan	Savanna grassland	Angola (Kisama NP, Kangandala NP, Luando R), Zambia (Kafue NP, Mweru Wantipa NP, Nsumbu NP), Malawi (Nyika NP, Kasungu NP, Vwaza Marsh GR), northeastern Namibia (Waterberg Plateau P), western & southeastern Zimbabwe (Hwange NP), northern Botswana (Chobe NP), South African lowveld (Kruger NP, Transvaal NRs)
Subspecies Which Occur Widely Outside the Region:		
*Nyassa Wildebeest	Savanna grassland	Northern Mozambique (Niassa GR)
Species Which Occur Marginally Within the Region:		
Black-fronted Duiker	Moist forest	Northern Angola
Bay Duiker	Moist forest	Northern Angola

[1] NP = National Park; NR = Nature Reserve; R = Reserve; FR = Forest Reserve; P = Park; GR = Game Reserve; GMA = Game Management Area.

Table 5

Captive Populations (as at 31 December 1985) of Antelopes which are *Rare, Threatened* or *Endangered* in Southern and South-central Africa. Source of information: ISIS (1986)

Species/ Subspecies	No. Zoos	No. in Captivity				No. Births in Last 12 Months
		Male	Female	Sex Unknown	Total	
Bay Duiker	7	21	18	1	40	7
Yellow-backed Duiker	8	13	22	1	36	7
Red Lechwe	9	32	51	0	83	29
Kafue Lechwe	2	7	14	0	21	7
Roan	10	22	45	1	68	9
Black Wildebeest	10	13	59	0	72	3
Bontebok	8	17	28	0	45	5

in a fenced breeding station within its natural habitat in northern Angola is among the proposals for this antelope's conservation (see chapter 3). In view of the probable recent decline of the giant sable's status and the continued insecurity of its natural range, investigations should be conducted into the possibility of assisting the Angolan conservation authorities to establish a captive breeding population elsewhere in the country as an immediate priority.

References

East, R. 1988. Summary of regional status of antelopes in East and Northeast Africa. *In* East, R. (Compiler). Antelopes: global survey and regional action plans. Part 1: East & Northeast Africa, pp. 71–76. Gland, IUCN.

Franklin, B.R. 1980. Evolutionary change in small populations. *In* Soule, M.E.; Wilcox, B.A. (Editors). Conservation biology, pp. 135–149. Sunderland, Sinaeur Associates.

ISIS. 1986. Captive population information for antelope. Mimeo Report, International Species Inventory System.

Wilson, V.J. 1987. IUCN/SSC Antelope Specialist Group and Chipangali Wildlife Trust action plan for duiker conservation. Bulawayo, Chipangali Wildlife Trust.

Chapter 14: Status of Antelope Communities and Identification of Regional Conservation Priorities

R. East

Introduction

It is now widely recognised that the long-term survival of wildlife species is dependent upon intelligent conservation of the ecosystems in which they occur, and that an ecosystem-based approach to the management of natural resources is essential for the maintenance of the earth's natural life-support processes (e.g., IUCN 1980; Siegfried & Davies 1982; Thibodeau & Field 1984). In practice, the ecosystem-based approach usually equates to site-specific conservation projects. Antelope communities comprise a major, integral part of many African ecosystems. The biological and aesthetic significance of antelopes have often been important factors in the establishment of African national parks and wildlife reserves.

Status of Antelope Communities Outside Conservation Areas

Increasing populations of people and domestic livestock and the expansion of settlement have reduced or eliminated antelope populations over wide areas of Southern and South-central Africa during the last 50 years. In the more densely populated areas, most large wild animals have been exterminated, e.g., in Lesotho, or reduced to remnant populations within conservation areas, e.g., in Malawi. In thinly populated areas there are still extensive tracts of land which retain large areas of relatively unmodified natural habitats outside protected areas, e.g., the plateau *Brachystegia* woodlands of Angola, Zambia and Mozambique. In these areas, the larger, more conspicuous antelopes of open country have often been eliminated or reduced to scattered remnants by uncontrolled hunting, but some species persist in significant numbers, especially those which are secretive and prefer dense cover, e.g., bushbuck, sitatunga and duikers in Zambia (Ansell 1959).

Antelope communities with fully representative species complements now survive mainly in and around conservation areas (including game management areas, which receive low levels of protection and management in some countries), which cover extensive areas of most of the region's major biomes. In some cases, antelopes move over large areas adjacent to or between parks and reserves, e.g., in the central and southern Kalahari of Botswana.

Outside conservation areas, the largest surviving populations of many antelopes within the region probably occur on farmland in Namibia, South Africa and Zimbabwe. The rapid growth of game farming in these countries during the last two decades has produced a marked increase in the numbers of many of the larger antelope species and expansion of their ranges, in some cases into areas beyond the limits of their natural occurrence. While the wildlife utilisation industry is a strong positive force for antelope conservation, the introduction of alien species and subspecies and potential contamination of natural gene pools require careful control.

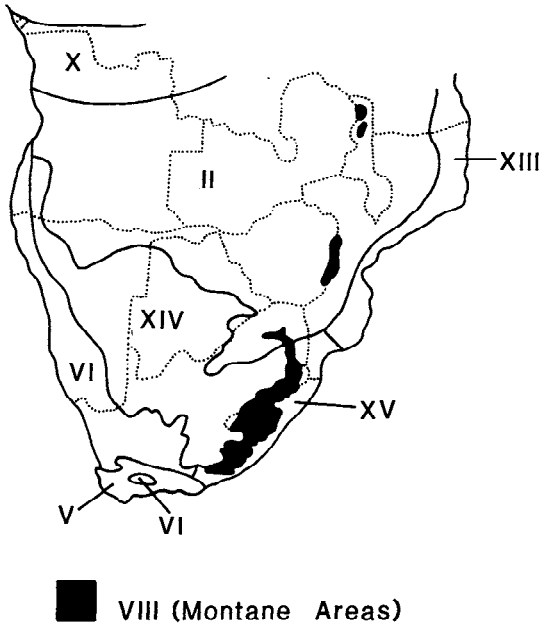

Fig. 1. Major biogeographic divisions (phytochoria) in Southern and South-central Africa, as recognised by White (1983) and used by MacKinnon & MacKinnon (1986) to review the protected areas of the Afrotropical biogeographic realm. Phytochoria are numbered as in MacKinnon & MacKinnon (1986)—II: Zambezian regional centre of endemism; V: Cape regional centre of endemism; VI: Karoo-Namib regional centre of endemism; VIII: Afromontane archipelago-like regional centre of endemism; X: Guinea-Congolia/Zambezia regional transition zone; XIII: Zanzibar-Inhambane regional mosaic; XIV: Kalahari-Highveld regional transition zone; XV: Tongaland-Pondoland regional mosaic.

Table 1

Scoring System for Antelope Populations Used to Assess Biological Importance of Areas for Antelope Communities

	Antelopes Confined to Region				Antelopes Widespread Outside Region[3]			
Status within Region[1]	Popn.[2]	Score	Popn.	Score	Popn.	Score	Popn.	Score
Endangered	≥100	7	<100	4	≥100	3	<100	1
Rare/Threatened	≥500	6	<500	3	≥500	3	<500	1
Satisfactory	≥1000	5	<1000	2	≥1000	3	<1000	1

[1] See chapter 13.

[2] Population within area: where numbers are unknown, major populations (≥100 for *endangered* antelopes, ≥500 for *rare/threatened* antelopes, ≥1000 for antelopes whose status is *satisfactory*) are assumed to occur in areas where the species/subspecies is known to be widespread and relatively common, and there is an extensive area of suitable habitat.

[3] Includes antelopes for which the region contains internationally significant populations, and those which occur only marginally within the region.

Table 2

Scores for Biological Importance and Ratings of Conservation Status of Major Areas for Antelope Conservation in Different Biogeographic Divisions (see Fig. 1) of Southern and South-central Africa

Conservation Area	No. Spp.[1]	Biological Importance[2]	Species Occurring in Major Populations[3]	Conservation Status[4]
ZAMBEZIAN REGIONAL CENTRE OF ENDEMISM				
ANGOLA:				
Kangandala NP–Luando R	12	29*	bushbuck, grey duiker, red lechwe, southern reedbuck, giant sable	3
Luiana PR	13	26	greater kudu, red lechwe, blue wildebeest, steenbok	4
Mavinga PR	13	23	greater kudu, blue wildebeest, steenbok	4
Bikuar NP	12	22	common eland, blue wildebeest, steenbok	4
Kameia NP	10	16	blue wildebeest	4
Mupa NP	12	15		3
Kisama NP	6	14*	bushbuck, common eland, blue duiker, roan	3
Bufalo PR	5	5		4
ZAMBIA:				
Kafue NP	20	59*	bushbuck, common eland, greater kudu, blue, yellow-backed & grey duikers, waterbuck, red lechwe, puku, southern reedbuk, roan, sable, blue wildebeest, Lichtenstein's hartebeest, oribi, Sharpe's grysbok, impala	3
South Luangwa NP–Luambe NP–North Luangwa NP	15	38*	bushbuck, common eland, greater kudu, grey duiker, waterbuck, puku, Cookson's wildebeest, Lichtenstein's hartebeest, klipspringer, Sharpe's grysbok, impala	2
Sioma Ngwezi NP	12	35	common eland, greater kudu, grey duiker, roan, sable, blue wildebeest, tsessebe, steenbok, impala	4
Mweru Wantipa NP	14	28*	bushbuck, sitatunga, grey duiker, puku, southern reedbuck, roan, sable	4
West Lunga NP	15	25	bushbuck, blue & yellow-backed duikers, puku, impala	4
Nsumbu NP	14	24*	bushbuck, blue & grey duikers, puku, Lichtenstein's hartebeest	3
Liuwa Plain NP	9	20*	blue wildebeest, tsessebe, oribi	4
Bangweulu GMA	5	20*	sitatunga, black lechwe, southern reedbuck, tsessebe, oribi	3
Lukusuzi NP	12	16	grey duiker, Lichtenstein's hartebeest	4
Blue Lagoon NP	11	16*	Kafue lechwe	4
Lochinvar NP	6	15*	Kafue lechwe, blue wildebeest	3
Kasanka NP	13	13*		3
Lavushi Manda NP	13	13*		4
Lower Zambezi NP	10	12	klipspringer	4
Isangano NP	10	12		4
Lusenga Plain NP	11	11*		4
Mosi-Oa-Tunya NP	8	9		3
Nyika NP (partly in the Afromontane zone)	8	8		4
MALAWI:				
Lengwe NP	11	19*	bushbuck, nyala, suni	1
Kasungu NP	14	18*	grey duiker, southern reedbuck	1
Nyika NP (part)	11	15	bushbuck, grey duiker	1
Liwonde NP	10	14*	bushbuck, sable	1
Majete GR	11	13*	greater kudu	2
Vwaza Marsh GR	12	12*		2
Nkhotakota GR	12	12*		2
Mwabvi GR	11	12*		3
Lake Malawi NP	4	4		2
MOZAMBIQUE:				
Gorongosa NP–Zambezi Valley WU (part)	17	45*	bushbuck, nyala, Natal red & grey duikers, waterbuck, southern reedbuck, sable, blue wildebeest, Lichtenstein's hartebeest, oribi, suni, impala	4
Zinave NP	15	27	bushbuck, grey duiker, steenbok, suni, impala	4
Niassa GR	11	23*	bushbuck, greater kudu, grey duiker, sable, Nyassa wildebeest, klipspringer	4
Banhine NP	9	15	grey duiker, steenbok	4
Gile GR	10	10		4
NAMIBIA:				
Etosha NP	11	32*	greater kudu, gemsbok, blue wildebeest, Kirk's dikdik, steenbok, springbok	1
Khaudom GP	10	14*		2

Table 2
Continued

Conservation Area	No. Spp.[1]	Biological Importance[2]	Species Occurring in Major Populations[3]	Conservation Status[4]
Western Caprivi GR	10	12*		3
Mahango GP	9	11*		2
BOTSWANA:				
Chobe NP	18	40*	greater kudu, common eland, grey duiker, sable, blue wildebeest, tsessebe, steenbok, impala	3
Moremi GR	13	28*	red lechwe, blue wildebeest, tsessebe, impala	3
Nxai Pan NP–Makgadikgadi GR	11	26*	blue wildebeest, steenbok, springbok	3
ZIMBABWE:				
Hwange NP–Matetsi SA–Kazuma Pan NP-Zambezi NP–Victoria Falls NP–Deka SA	17	43*	bushbuck, greater kudu, common eland, grey duiker, waterbuck, southern reedbuck, roan, sable, blue wildebeest, steenbok, impala	1
Middle Zambezi Valley (Mana Pools NP–Charara SA–Urungwe SA–Sapi SA–Dande SA–Doma SA)	15	35	bushbuck, greater kudu, common eland, grey duiker, waterbuck, sable, klipspringer, Sharpe's grysbok, impala	1
Gonarezhou NP–Malapati SA	15	34	bushbuck, nyala, greater kudu, grey duiker, steenbok, Sharpe's grysbok, suni, impala	3
Sebungwe (Chizarira NP–Chirisa SA, Chete SA, Matusadona NP)	13	28	bushbuck, greater kudu, grey duiker, waterbuck, klipspringer, Sharpe's grysbok, impala	3
Matobo NP	14	18*	klipspringer	1
Kyle RP	14	17*		2
McIlwaine RP	10	12*		2
Mushandike S	10	11*		1
Umfurudzi SA	5	9	bushbuck, grey duiker	2
Tuli SA	7	8		2
Ngezi RP	6	6*		2
Melsetter S	3	3		2
SOUTH AFRICA:				
Kruger NP (part)	19	48*	bushbuck, nyala, greater kudu, grey duiker, waterbuck, southern reedbuck, sable, blue wildebeest, tsessebe, steenbok, impala	1
Doorndraai Dam, Percy Fyfe, Loskop Dam & other Transvaal NRs	19	28*	greater kudu, impala	1
Pilanesberg NP	15	21*	mountain reedbuck, impala	1
KALAHARI-HIGHVELD REGIONAL TRANSITION ZONE				
NAMIBIA:				
Waterberg Plateau P	11	13*		2
Daan Viljoen GP	8	12*		1
Von Bach R	6	7*		1
BOTSWANA:				
Central Kgaligadi GR–Khutse GR	8	32*	greater kudu, common eland, grey duiker, gemsbok, blue wildebeest, red hartebeest, steenbok, springbok	3
Gemsbok NP–Mabuasehube GR	8	28	common eland, gemsbok, blue wildebeest, red hartebeest, steenbok, springbok	2
Mannyelanong Hill GR	3	3		3
SOUTH AFRICA:				
Willem Pretorius GR, Tussen-die-Riviere GF, Verwoerd Dam NR & other Orange Free State NRs	14	39*	mountain reedbuck, black wildebeest, red hartebeest, blesbok, steenbok, impala, springbok	1
Kalahari Gemsbok NP	8	28*	common eland, gemsbok, blue wildebeest, red hartebeest, steenbok, springbok	1
Rolfontein, Doornkloof, Oviston, Karoo, Commando Drift, Leon Taljaardt & other Cape Province NRs	13	28*	mountain reedbuck, steenbok, springbok	1
Suikerbosrand, S.A. Lombard & other Transvaal NRs	14	27*	blesbok, springbok	1
Itala GR (part)	13	16*		1
Mountain Zebra NP	10	15*		1
Vaalbos NP	6	8*		1
SWAZILAND:				
Mlilwane WS	11	13		1

Table 2
Continued

Conservation Area	No. Spp.[1]	Biological Importance[2]	Species Occurring in Major Populations[3]	Conservation Status[4]
KAROO-NAMIB REGIONAL CENTRE OF ENDEMISM				
ANGOLA:				
Iona NP	7	21	gemsbok, Kirk's dikdik, steenbok, springbok	4
Mocamedes PR	6	8		3
Chimalavera RP	1	2		4
NAMIBIA:				
Namib-Naukluft P	6	16*	gemsbok, klipspringer, springbok	1
Skeleton Coast P	4	9*	gemsbok	1
Hardap GR	6	9*		1
Fish River Canyon NR	4	5*		1
SOUTH AFRICA:				
Karoo NP	10	16*		1
Hester Malan, Akkerendam & other Cape Province NRs	9	14*		1
Augrabies Falls NP	5	6*		1
CAPE REGIONAL CENTRE OF ENDEMISM				
SOUTH AFRICA:				
De Hoop, Cape of Good Hope & other Cape Province NRs; Cederberg & other State Forest WAs & NRs	10	27	bontebok, steenbok, Cape grysbok, grey rhebok	1
Bontebok NP	5	9*		1
Tsitsikamma Forest & Coastal NPs	3	4		1
AFROMONTANE REGIONAL CENTRE OF ENDEMISM				
MALAWI:				
Nyika NP (part)	8	17*	common eland, grey duiker, southern reedbuck	1
ZIMBABWE:				
Nyanga NP–Mtarazi Falls NP	9	10		2
Chimanimani NP	6	6		2
SOUTH AFRICA:				
Giant's Castle GR–Mkhomazi WA & contiguous WAs & NRs	10	15*	common eland	1
Golden Gate Highlands NP	7	12*		1
Royal Natal NP–Rugged Glen NR	6	8*		1
Blyderivierspoort NR (part)	7	8*		1
SWAZILAND:				
Malolotja NR	7	12		1
LESOTHO:				
Sehlabathebe NP	4	6*		2
ZANZIBAR-INHAMBANE REGIONAL MOSAIC				
MOZAMBIQUE:				
Marromeu GR–Zambezi Valley WU (part)	17	29*	bushbuck, Natal red duiker, waterbuck, southern reedbuck, suni	4
Pomene GR	2	2		4
Bazaruto NP	1	1		4
TONGALAND-PONDOLAND REGIONAL MOSAIC				
MOZAMBIQUE:				
Maputo GR	7	8		4
SOUTH AFRICA:				
Kruger NP (part)	17	35*	bushbuck, greater kudu, grey duiker, waterbuck, southern reedbuck, blue wildebeest, steenbok, impala	1
Umfolozi GR–Corridor–Hluhluwe GR	13	31*	nyala, greater kudu, Natal red & grey duikers, waterbuck, blue wildebeest, impala	1
Mkuzi GR	12	25*	nyala, Natal red & grey duikers, suni, impala	1
Itala GR (part)	13	16*		1
Andries Vosloo & Thomas Baines NRs	11	16*		1
Pongola NR	12	14*		1

Table 2
Continued

Conservation Area	No. Spp.[1]	Biological Importance[2]	Species Occurring in Major Populations[3]	Conservation Status[4]
Eastern Shores, Vernon Crookes, Umtamvuna & other Natal NRs	11	14*	southern reedbuck	1
Ndumu GR–Tembe Elephant R	7	13*	nyala, suni	1
Addo Elephant NP	6	8*		1
Zuurberg NP	5	5*		1
SWAZILAND:				
Hlane GR	9	17*	blue wildebeest, impala	1
Mlawula NR–Ndzindza NR	6	6		1

[1] Total number of antelope species occurring; refers only to those species occurring within the specific biogeographic unit.
[2] Sum of scores for each species calculated according to criteria in Table 1; asterisks denote scores based on population estimates.
[3] As defined in Table 1.
[4] After MacKinnon & MacKinnon (1986). Level of management and protection—1: high; 2: moderate–high; 3: low–moderate; 4: nil–low.

Status of Antelope Communities Within Conservation Areas

Criteria for Assessment of Priorities: The existing network of conservation areas in Southern and South-central Africa is generally adequate to ensure the survival of most of the region's large mammals, at least on paper. In practice, protection and management of these areas varies from highly effective to non-existent.

Selection of priorities among conservation areas for the allocation of limited financial support at a regional or continental level requires some system of comparing the antelope communities of different areas. Considerable progress has been made recently towards a quantitative assessment of conservation priorities (e.g., Cumming & Jackson 1984; Bell & Martin 1986). In the Antelope Survey, two criteria are considered in assessing conservation priorities: biological importance and conservation status. The biological importance of areas for the conservation of antelope communities is assessed by assigning a score for each species' population according to the criteria in Table 1 (East 1988). Assessment of the conservation status of individual areas is based on the scoring system used by MacKinnon & MacKinnon (1986) to evaluate the effectiveness of management of protected areas in the Afrotropical realm.

The regional status of each species or subspecies (chapter 13) was used to derive its score for each area in the region in which it occurs. For each conservation area containing significant antelope populations, the score for biological importance was taken as the sum of the individual species/subspecies scores (each calculated according to Table 1; see East (1988) for further details) for that area. The conservation status of each area was taken directly from MacKinnon & MacKinnon (1986); their scores were adjusted slightly for a few areas to reflect the effectiveness of protection and management as it affects antelopes in particular. The results are shown separately for each of the region's major biogeographic divisions (Fig. 1) in Table 2.

Selection of Priorities: The arbitrary scoring system in Table 1 provides a framework (Table 2) for the discussion of priorities. Such scoring systems should guide, not dictate, the selection of priorities.

Given the limited resources available for international conservation action, attention can be focussed on maintaining the status of prime areas with high scores for both biological importance and conservation status, and/or improving conservation status where it is currently moderate or low for areas of high biological importance. There are several other important considerations in setting priorities. These include the cost-effectiveness of any proposed action, its feasibility, practicality, and chances of long-term success, and the resources required (Cumming & Jackson 1984). Other things being equal, areas requiring fewer inputs to maintain or improve their status should be given a higher priority than those requiring greater inputs, but this should not exclude assistance to the development of protected areas in countries where effective conservation has been precluded by factors such as warfare, e.g., Angola.

Table 3 lists areas identified as having international importance for antelope conservation. A substantial proportion of these areas currently have high conservation status, reflecting the generally high levels of protection and management within the conservation areas of countries such as Zimbabwe, Malawi, Namibia, South Africa and Swaziland. However, there is a critical lack of high or moderate-high conservation status for areas with high biological values for antelope conservation in the Zanzibar–Inhambane divisional unit, in both Southern and South-central Africa (Table 3) and East and Northeast Africa (East 1988).

Tables 2 and 3 underline the exceptionally outstanding international importance of the small number of very large conservation areas (> 18 000 sq km), viz., Kafue National Park and the Luangwa Valley conservation areas (including game management areas) (Zambia), Zambezi Valley Wildlife Utilisation Unit–Gorongosa National Park (Mozambique), Namib-Naukluft Park and Etosha National Park (Namibia), Central Kgaligadi Game Reserve and Gemsbok National Park (Botswana), Hwange National Park–Matetsi Safari Area–Zambezi National Park and contiguous protected areas (Zimbabwe), and Kruger National Park (South Africa). These areas are also of outstanding importance for other large herbivores, e.g., elephant, black rhinoceros, zebra, giraffe, hippopotamus, and/or buffalo, and for large carnivores, in accordance with biogeographical, genetic and ecological considerations (Soule et al. 1979; East 1981a,b, 1983; Soule & Simberloff 1986). Continued evolution of antelopes by natural selection may be confined to very large conservation areas which preserve the full spectrum of competitive herbivore species and natural predators (Frankel & Soule 1981).

National and International Conservation Priorities

Care must be taken in reconciling national interests with a regional or continental overview such as that sought here. The

Table 3

Conservation Areas within Major Biogeographic Divisions in Southern and South-central Africa of Outstanding International Importance for the Conservation of Antelope Communities

	Conservation Status*		
1	2	3	4
ZAMBEZIAN REGIONAL CENTRE OF ENDEMISM			
Kruger NP	South Luangwa NP–Luambe NP–North Luangwa NP	Kafue NP	Gorongosa NP–Zambezi Valley WU
Hwange NP–Matetsi SA–Kazuma Pan NP–Zambezi NP–Deka SA		Chobe NP	Sioma Ngwezi NP
Mana Pools NP–Charara SA–Urungwe SA–Sapi SA–Chewore SA–Dande SA–Doma SA		Gonarezhou NP–Malapati SA	Mweru Wantipa NP
Etosha NP		Kangandala NP–Luando R	Zinave NP
Sebungwe (Chizarira NP–Chirisa SA, Chete SA, Matusadona NP)		Moremi GR	Luiana PR
Doorndraai Dam, Percy Fyfe, Loskop Dam & other Transvaal NRs		Nxai Pan NP–Makgadikgadi Pans GR	West Lunga NP
Lengwe NP		Nsumbu NP	Mavinga PR
Kasungu NP		Bangweulu GMA	Niassa GR
Pilanesberg NP			Bikuar NP
Matobo NP			Liuwa Plain NP
KALAHARI-HIGHVELD REGIONAL TRANSITION ZONE			
Kalahari Thornveld:			
Kalahari Gemsbok NP	Gemsbok NP–Mabuasehube GR	Central Kgaligadi GR–Khutse GR	
Rolfontein, Doornkloof, Karoo, Commando Drift, Leon Taljaardt & other Cape Province NRs			
Highveld:			
Willem Pretorius GR, Tussen-die-Riviere GF, Verwoerd Dam NR & other Orange Free State NRs			
Suikerbosrand & other Transvaal NRs			
KAROO-NAMIB REGIONAL CENTRE OF ENDEMISM			
Namib-Naukluft P			Iona NP
Karoo NP			
Hester Malan, Akkerendam & other Cape Province NRs			
Skeleton Coast P			
Hardap GR			
CAPE REGIONAL CENTRE OF ENDEMISM			
De Hoop, Cape of Good Hope & other Cape Province NRs; Cederberg & other WAs			
Bontebok NP			
Tsitsikamma Forest & Coastal NPs			
AFROMONTANE REGIONAL CENTRE OF ENDEMISM			
Nyika NP (Malawi)	Nyanga NP–Mtarazi Falls NP		
Giant's Castle GR–Mkhomazi WA & contiguous WAs & NRs			
Malolotja NR			
Golden Gate Highlands NP			
ZANZIBAR–INHAMBANE REGIONAL MOSAIC			
			Marromeu GR–Zambezi Valley WU
TONGALAND–PONDOLAND REGIONAL MOSAIC			
Kruger NP			
Umfolozi GR–Corridor–Hluhluwe GR			
Mkuzi GR			
Hlane GR			

* 1: high; 2: moderate–high; 3: low–moderate; 4: nil–low; see Table 2.

aim of allocating scores to individual conservation areas in Table 2 is to assist the identification of areas of such exceptional importance that their conservation assumes very high international priority. It must not be inferred that areas which are given moderate or low scores are unimportant. Mannyelanong Hill Game Reserve in Botswana, for example, supports three antelope species and inevitably receives a much lower score than larger protected areas with diverse antelope communities (Table 2). Nevertheless, this reserve is the only protected area in Botswana where two antelope species, mountain reedbuck and klipspringer, occur. It is therefore of considerable national importance for antelope conservation.

In practice, national conservation objectives are of primary importance, since long-term conservation of antelopes depends on the commitment by individual countries to wildlife conservation, and the actions of national wildlife management agencies. All of the areas listed in Table 2 are of national importance for antelope conservation. All of these areas are also of international significance, since conservation of genetic material requires the survival of each species in as wide a range of its natural habitats as possible.

References

Ansell, W.F.H. 1959. Further data on Northern Rhodesian ungulates. *Mammalia 23:* 332–349.

Bell, R.H.V.; Martin, R.B. 1986. Identification of conservation priority. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 43–75. Washington DC, US Peace Corps.

Cumming, D.H.M.; Jackson, P. (Editors). 1984. The status and conservation of Africa's elephants and rhinos. Proceedings of Joint Meeting of IUCN/SSC African Elephant & African Rhino Specialist Groups at Hwange Safari Lodge, Zimbabwe, 30 July–7 August 1981. Gland, IUCN.

East, R. 1981a. Area requirements and conservation status of large African mammals. *Nyala 7:* 3–20.

East, R. 1981b. Species-area curves and populations of large mammals in African savanna reserves. *Biological Conservation 21:* 111–126.

East, R. 1983. Application of species-area curves to African savanna reserves. *African Journal of Ecology 21:* 123–128.

East, R. 1988. Status of antelope communities and identification of regional conservation priorities. *In* East, R. (Compiler). Antelopes: global survey and regional action plans. Part 1: East & Northeast Africa, pp. 76–85. Gland, IUCN.

Frankel, O.H.; Soule, M.E. 1981. Conservation and evolution. Cambridge, Cambridge University Press.

IUCN. 1980. World conservation strategy: living resource conservation for sustainable development. Gland, IUCN.

MacKinnon, J.; MacKinnon, K. 1986. Review of the protected areas system in the Afrotropical realm. Gland and Cambridge, IUCN.

Siegfried, W.R.; Davies, B.R. (Editors). 1982. Conservation of ecosystems: theory and practice. Pretoria, CSIR.

Soule, M.E.; Simberloff, D. 1986. What do genetics and ecology tell us about the design of nature reserves? *Biological Conservation 35:* 19–40.

Soule, M.E.; Wilcox, B.A.; Holtby, C. 1979. Benign neglect: a model of faunal collapse in the game reserves of East Africa. *Biological Conservation 15:* 259–272.

Thibodeau, F.R.; Field, H.H. (Editors). 1984. Sustaining tomorrow: a strategy for world conservation and development. Hanover, University Press of New England.

White, F. 1983. The vegetation of Africa: a descriptive memoir to accompany the UNESCO/AETFAT/UNSO vegetation map of Africa. Paris, UNESCO.

Chapter 15: Regional Action Plan for Antelope Conservation

Action for antelope conservation can be considered separately at two discrete, equally important operational levels: political and government action, and field action. The latter involves two types of activity: surveys to identify conservation needs of specific taxa or antelope communities, and improvement of the management and protection of existing and proposed conservation areas.

1. Political and Government Action

Top-level approaches by the Director-General of IUCN are appropriate in the following cases, as opportunities permit:

1.1 *Improvement of the Conservation Situation in Angola*

Angola urgently needs international assistance to develop an effective conservation programme and preserve its remaining wildlife resources. At present this is precluded by political turbulence and armed conflict which affect considerable areas of the country. As soon as circumstances permit, a high level approach should be made to the Government of Angola, to encourage the preparation and implementation of an appropriate conservation master plan for the country and urge Angola to become a member of IUCN.

1.2 *Support for Conservation in Mozambique*

Adverse factors affecting antelopes in Mozambique include widespread poaching and insufficient resources within the Wildlife and Forestry Department to combat this illegal activity. The Government of Mozambique is faced with severe problems, ranging from the effects of drought and food shortages to armed insurrection, but a positive attitude to wildlife conservation by provincial governments and rural people was demonstrated by the establishment and effective protection of the Zambezi Valley Wildlife Utilisation Unit from the mid-1970s to 1982. Since then, guerilla activity has affected this Unit. International support for the re-establishment of effective protection and management of Mozambique's conservation areas should be given high priority, as opportunities allow.

1.3 *Development of National Conservation Strategies*

National Conservation Strategies for the integrated development and conservation of natural life-support processes, upon which the survival of both man and wildlife depend, should receive high priority. The educational value of preparing such policies may be as important as the final documents. Zambia is currently implementing a National Conservation Strategy, and several other countries in the region are preparing National Conservation Strategies.

Antelope conservation will be achieved most effectively if it is part of an overall environmental conservation plan that includes other key aspects of natural ecosystems, such as significant topographical, geological and hydrological features, flora, and other fauna (e.g., elephants, primates, large carnivores), and is inte-

grated with environmentally sound development programmes that improve the quality of human life. There is a need to minimise conflicts between conservation and development by integrating decisions at the policy-making level. Forging closer links between conservation and development projects is therefore an important objective (Lusigi 1984).

National Conservation Strategies should be developed as an integral aspect of National Development Plans, in which the Conservation Strategy is synonymous with government policy. Development of strategies for the conservation of renewable natural resources is unlikely to succeed if it is carried out in isolation. Land-use zoning, for example, is necessary to integrate wildlife conservation with other forms of land use, such as agricultural, livestock and industrial production. National Conservation Strategies should be prepared by country nationals working within their country's appropriate government systems (with technical advice from expatriates if necessary), and must be developed and implemented by the government hierarchy, from the top national policy-making level to the local level (districts, provinces etc.).

1.4 *Regional Cooperation in Wildlife Conservation*

IUCN should continue to promote inter-governmental cooperation between national agencies responsible for the conservation and management of antelope populations in ecosystems which traverse international boundaries. Examples of outstanding international importance for antelope conservation include Kalahari Gemsbok National Park (South Africa)–Gemsbok National Park and Mabuasehube Game Reserve (Botswana), and Lower Zambezi National Park (Zambia)–Mana Pools National Park and contiguous safari areas (Zimbabwe).

2. Field Action: Surveys

2.1 *Current Status of Antelopes in Angola*

No recent information (post-1983) on the status of antelopes in Angola is available to the Antelope Specialist Group. As soon as the political and military situation allows, surveys should be initiated to determine the status of Angola's remaining wildlife, with particular emphasis on unique forms such as the giant sable. The overall objective of these surveys should be to identify key areas where it is feasible to re-establish effectively protected and managed conservation areas.

2.2 *Forest Duikers*

Forest duikers (*Cephalophus* spp.) are among the least known African antelopes scientifically, yet they are an important source of meat and other products such as hides in many countries. Surveys are required to obtain more precise information about the current status of forest duikers, such as blue, Natal red, and yellow-backed, in most parts of their ranges within the region.

3. Field Action: Management of Conservation Areas

This section outlines the needs of key existing and proposed conservation areas for antelope conservation in the major biogeographic divisions of Southern and South-central Africa. MacKinnon & MacKinnon (1986) provide an overview of general conservation requirements in each of these biogeographic units.

Comprehensive project development missions will be necessary to determine site-specific management proposals and investment requirements for many of the areas identified as having key importance for antelope conservation within the region. IUCN and other international conservation organisations should place high priority on obtaining funds for such project development work.

3.1 *Zambezian Regional Centre of Endemism*

This unit covers a large area of Southern and South-central Africa and includes many of the region's most spectacular concentrations of savanna and wetland antelopes. The level of protection of conservation areas ranges from generally very high in countries such as Malawi, Zimbabwe, Namibia and South Africa, to moderate in Zambia and Botswana, and low in Angola and Mozambique. Several of these countries, e.g., Malawi, Zambia, Botswana, Angola and Mozambique, require international financial and/or technical assistance to maintain or improve the protection and management of their conservation areas.

3.1.1 *Zambia: Kafue National Park, South Luangwa National Park–Luambe National Park–North Luangwa National Park, Sioma Ngwezi National Park, Mweru Wantipa National Park, West Lunga National Park, Nsumbu National Park, Liuwa Plain National Park, Bangweulu GMA, Lochinvar National Park–Blue Lagoon National Park*

Zambia's system of conservation areas includes representative examples of almost all of the country's major antelope habitats, and is of outstanding international importance for antelope conservation. Kafue National Park protects a large area of *Brachystegia* woodland which supports some of Africa's largest protected populations of characteristic "miombo" antelopes, such as sable, roan and Lichtenstein's hartebeest. This park also includes substantial areas of mopane woodland, floodplain grassland and other habitats with locally high densities of species such as blue wildebeest, waterbuck, puku and red lechwe. *Brachystegia* woodlands are also protected within most of Zambia's other national parks. The Luangwa Valley conservation areas contain extensive areas of mopane savanna, *Kigelia/Combretum* and *Combretum/Terminalia* woodlands, thicket, riparian forest and grassland, and support large populations of antelopes such as impala, waterbuck, puku, greater kudu, eland and Cookson's wildebeest. Other major habitats protected within Zambia's national parks include woodland savanna and open plains (Sioma Ngwezi), *Cryptosepalum* forest supporting a relatively high density of blue and yellow-backed duikers (West Lunga), short grassland with substantial populations of blue wildebeest, tsessebe and oribi (Liuwa Plain), and extensive wetlands (e.g., Mweru Wantipa, Lochinvar, Blue Lagoon). Sitatunga and puku are common in the swamps and floodplains of Mweru Wantipa. Lochinvar and Blue Lagoon National Parks protect large numbers of the endemic Kafue lechwe on part of the floodplain of the Kafue Flats. The Bangweulu Basin, which is mainly within game management areas, supports large numbers of another endemic lechwe subspecies, the black lechwe, plus one of Africa's largest sitatunga populations and substantial numbers of tsessebe, oribi and southern reedbuck.

The national parks system in Zambia was formerly among the best administered and managed in Africa. A massive upsurge in poaching over the last decade has markedly reduced some wildlife populations, especially the most commercially valuable species (elephant and black rhino), but antelopes remain common to abundant within many of the country's protected areas. International assistance is vital for the reinstatement of effective protection and management of these areas, and to ensure realisation of the potential of the country's rich resources of antelopes and other wildlife to play a significant role in Zambia's economic development.

3.1.2 *South Africa: Kruger National Park; Doorndraai Dam, Percy Fyfe, Loskop Dam and other Transvaal Nature Reserves; Pilanesberg National Park*

Kruger National Park protects a major antelope community, including typical lowveld species such as impala, greater kudu,

blue wildebeest, tsessebe, waterbuck and sable. Maintenance of the high level of protection and management of this park will require additional measures to those already in place, e.g., protection of the park's rivers from the effects of progressive desiccation or serious pollution from outside. Pilanesberg National Park and Transvaal's lowveld and bushveld nature reserves also protect important antelope communities at the southeastern limits of the Zambezian biogeographic unit.

3.1.3 *Zimbabwe: Hwange National Park–Matetsi Safari Area–Kazuma Pan National Park–Zambezi National Park–Victoria Falls National Park–Deka Safari Area, Mana Pools National Park–Charara Safari Area–Urungwe Safari Area–Sapi Safari Area–Chewore Safari Area–Dande Safari Area–Doma Safari Area, Gonarezhou National Park–Malapati Safari Area, Sebungwe (Chizarira National Park–Chirisa Safari Area, Chete Safari Area, Matusadona National Park), Matobo National Park*

Zimbabwe's lowveld conservation areas contain several internationally significant antelope communities. Maintenance of the generally high conservation status of these areas is an important priority in international antelope conservation. The Kalahari sand woodlands, mopane woodland, *Acacia* woodland and shrub savanna of Hwange National Park, Matetsi Safari Area and contiguous conservation areas support a diverse community of savanna antelopes, including major populations of species such as eland, greater kudu, sable, roan, blue wildebeest, steenbok and impala. Mana Pools National Park and the contiguous safari areas in the middle Zambezi Valley protect Zimbabwe's largest and most valuable example of riparian *Acacia* woodland on alluvial terraces, plus a large area of valley *Commiphora/Combretum* thicket intergrading into *Brachystegia* woodland on the valley escarpment. These conservation areas contain a major antelope community, including substantial numbers of eland, greater kudu, waterbuck, sable, Sharpe's grysbok and impala. The Sebungwe conservation areas also protect Zambezi Valley habitats, on the southern shores of Lake Kariba, and escarpment *Brachystegia* woodland. Gonarezhou National Park in the southeast contains mopane savanna, *Androstachys* thickets and riverine woodlands which support an important lowveld antelope community, including nyala and suni. The granite hills of Matobo National Park in southwestern Zimbabwe protect a diverse antelope community (several species reintroduced), including a large population of klipspringer.

3.1.4 *Namibia: Etosha National Park*

Etosha National Park protects a very large area of mopane savanna, bushland and open grassy plains around the vast, seasonally inundated Etosha Pan, near the boundary of the Zambezian and Kalahari-Highveld biogeographic units. It contains a major antelope community which includes both Zambezian and Kalahari elements, with large populations of greater kudu, gemsbok, blue wildebeest, Kirk's (Damaraland) dikdik, steenbok and springbok, plus the largest protected population of black-faced impala. Maintenance of the high conservation status of this national park is a high priority in international antelope conservation.

3.1.5 *Botswana: Chobe National Park, Moremi Game Reserve, Nxai Pan National Park–Makgadikgadi Pans Game Reserve, Linyanti Swamp*

The conservation areas of northern Botswana include several areas of major international importance for antelope conservation. Chobe National Park contains extensive areas of Kalahari woodland, mopane woodland, and open grassy plains, which support an exceptionally diverse savanna antelope community. Nxai Pan National Park and Makgadikgadi Pans Game Reserve are primarily important for the protection of the wet and dry season ranges, respectively, of large migratory populations of blue wildebeest and zebra. Moremi Game Reserve includes representative examples of all of the major habitats of the Okavango Delta apart from papyrus swamp, and supports the largest surviving populations of several of the Delta's floodplain and savanna antelopes, e.g., red lechwe, tsessebe, blue wildebeest, waterbuck, southern reedbuck, greater kudu, sable and impala. The swamp-dwelling sitatunga occurs in larger numbers in the northern and central Okavango than within Moremi Game Reserve.

At present, natural habitats and wildlife populations are generally satisfactory in the conservation areas of northern Botswana, but there is a need to enhance the protection and management of these areas to ensure their long-term future. This should include improved enforcement of the laws and regulations protecting wildlife, and development and implementation of management plans for conservation areas.

In addition, the natural ecosystems of the Okavango Delta are potentially threatened by such factors as the expansion of cattle into the Delta following the eradication of tsetse fly, and large-scale water removal for development schemes. The Okavango is a major African wetland and one of Botswana's most important natural resources. Development of the Delta is inevitable, but it should proceed gradually with minimal disruption to natural biomes. The Government's present policy of attempting to balance the conflicting requirements of conservation and development within the Delta is realistic and deserves international support. This policy includes proposals to increase substantially the area of protected natural habitats. Improved protection for Botswana's other major wetland, the Linyanti Swamp (which also supports important populations of red lechwe and sitatunga), is also of international significance to antelope conservation.

3.1.6 *Mozambique: Gorongosa National Park–Zambezi Valley Wildlife Utilisation Unit, Zinave National Park, Niassa Game Reserve*

Gorongosa National Park and part of the adjacent Zambezi Valley Wildlife Utilisation Unit contain Mozambique's largest surviving concentration of Zambezian wildlife, including large populations of antelopes such as bushbuck, nyala, waterbuck, sable, blue wildebeest, Lichtenstein's hartebeest, oribi and impala. Zinave National Park lies in a transition zone between the relatively arid southern part of Mozambique and the moister central region. It includes mopane, *Acacia, Brachystegia* and broadleaf savannas and formerly supported a diverse and abundant antelope community. Niassa Game Reserve in the northern *Brachystegia* woodlands may still contain substantial numbers of antelopes such as greater kudu, grey duiker and sable, plus what is probably the country's last viable population of Nyassa wildebeest.

All of Mozambique's conservation areas have suffered to varying degrees from a breakdown in protection and law enforcement, increased poaching, and invasion by cultivators and cattle. Re-establishment of effective protection and management of these areas will require international assistance, e.g., to increase the numbers of trained personnel and equipment to adequate levels, and to enhance awareness of the value of wildlife conservation among rural people, government officials and decision makers.

3.1.7 *Angola: Kangandala National Park–Luando Natural Integral Reserve, Luiana Partial Reserve, Mavinga Partial Reserve, Bikuar National Park*

Kangandala National Park lies on the southern edge of the Guinea-Congolia/Zambezia regional transition zone, but is included with the Zambezian unit here. The Guinea-Congolia/Zambezia zone is not of major conservation importance, since it con-

sists largely of habitat types which are also found within adjacent biogeographic units (MacKinnon & MacKinnon 1986). This national park and the Luando Reserve (which is within the Zambezian unit) comprise *Brachystegia* woodland and riverine floodplains and are of major international importance as the only conservation areas which contain giant sable. Other antelopes which occur in substantial numbers include bushbuck, grey duiker, red lechwe, roan and southern reedbuck. Apart from cessation of the lawlessness and intermittent armed conflict which affect this area, the key to the long-term future of the wildlife of Luando-Kangandala is separation of people from wildlife, e.g., the needs of the large and increasing human population within the national park and reserve will eventually lead to large-scale degradation of the giant sable's woodland habitat. Key recommendations to ensure the giant sable's future include the establishment of a Giant Sable National Park incorporating the existing Kangandala National Park, part of the Luando Reserve, and the area between the park and the reserve, and exclusion of human settlement, cultivation, livestock and woodcutting. Sufficient land for human exploitation would have to be provided outside this proposed national park to satisfy the needs of the present population for cultivation, building materials and fuel. Utilisation of peripheral sable herds outside the national park could be organised to provide economic benefits to the local people, e.g., through carefully controlled trophy hunting and establishment of a giant sable breeding station to provide animals for sale to overseas zoos.

Luiana and Mavinga Partial Reserves and Bikuar National Park include a range of important habitats in southern Angola, such as mopane and *Baikiaea* woodland, floodplain grassland, and *Brachystegia* woodland, but have very little or no protection at present. Improvement of the conservation status of these areas is of international significance in antelope conservation.

3.1.8 *Malawi: Lengwe National Park, Kasungu National Park*

Lengwe National park in the lower Shire Valley includes dry deciduous thicket, *Acacia* and mopane savannas and supports high densities of antelopes such as bushbuck, nyala and suni. Kasungu National Park comprises plateau *Brachystegia* woodland and valley *Terminalia-Combretum* savanna. It supports an internationally significant antelope community, including species typical of Malawi such as roan, sable, Lichtenstein's hartebeest and southern reedbuck. The high conservation status of these parks and most of Malawi's other conservation areas is an outstanding achievement for a small developing country and deserves international financial support as necessary, to ensure the long-term protection of these areas.

3.2 *Kalahari-Highveld Regional Transition Zone*

This unit lies entirely within the Southern and South-central African region, extending from the arid savanna and semi-desert of the Kalahari to the highveld grassland (altitude 1200–2150 m) of the interior plateau of South Africa. Large areas of the unit's original vegetation have been modified or degraded by human use and livestock. There are several large conservation areas in the Kalahari. Protected areas of highveld grassland are relatively small but generally well managed.

3.2.1 *Botswana: Central Kgaligadi Game Reserve–Khutse Game Reserve, Gemsbok National Park–Mabuasehube Game Reserve*

The Botswana section of the Kalahari contains the region's largest surviving free-ranging populations of antelopes such as gemsbok, springbok, red hartebeest, blue wildebeest and eland. Most of these species are independent of surface water and can obtain all of their survival needs within the Kalahari, but the blue wildebeest requires access to drinking water in very dry years. This access is now severely restricted by the veterinary cordon and other fences which have been erected along much of the perimeter of the Botswana section of the Kalahari during the last 30 years. The northern Kalahari wildebeest population (formerly Africa's second largest population of this species, outnumbered only by the Serengeti population in East Africa) suffered heavy mortality during the drought years of the early 1980s, especially in the 1983 dry season. Kalahari wildlife has also been affected adversely by expanding human settlement, poaching from vehicles, and a low level of protection and management in the Central Kgaligadi and Khutse Game Reserves.

A commitment to counteract the adverse trends influencing Kalahari wildlife was announced by the Ministry of Commerce and Industry in July 1986, following consideration of a Government-appointed fact-finding mission. It was announced that the boundaries and status of the Central Kgaligadi Game Reserve will be maintained as at present (rejecting pressure from some elements of the cattle industry to de-gazette the southern two-thirds of the reserve), that the development of settlements within the reserve will be frozen and the people involved encouraged to move (the people involved are the Basarwa (Bushmen), for whose benefit the reserve was originally declared to protect their way of life), that wildlife policies should be speedily implemented to facilitate faster realisation of the economic benefits from wildlife, that there should be an immediate and substantial increase in the reserve's staff and logistic support, and that Wildlife Management Areas adjacent to the reserve should be gazetted as soon as possible to secure seasonal access to permanent water by migratory wildlife. Implementation of these recommendations will represent a major step towards successfully integrating the development of wildlife-based industries with other forms of land use in the Kalahari. International support for these actions is a high priority in antelope conservation.

3.2.2 *South Africa: Kalahari Gemsbok National Park; Rolfontein, Doornkloof, Karoo, Commando Drift, Leon Taljaardt and other Cape Province Nature Reserves*

Kalahari Gemsbok National Park protects an important example of the natural habitats and wildlife of the southern Kalahari, including major populations of antelopes such as gemsbok, springbok, eland, red hartebeest, blue wildebeest and steenbok. Springbok and the larger antelopes move widely between Kalahari Gemsbok National Park and the contiguous Gemsbok National Park, Mabuasehube Game Reserve and adjacent areas in Botswana. At present these conservation areas are well protected. Maintenance of their present size and unrestricted movement of wildlife between them is essential if the natural ecosystem of the southern Kalahari is to persist.

The provincial (e.g., Rolfontein, Doornkloof, Karoo and Commando Drift) and local authority (e.g., Leon Taljaardt) nature reserves of the northern and eastern Cape Province protect important remnants of the antelope populations of this biogeographic unit. Maintenance of the high conservation status of these areas is of international significance to antelope conservation.

3.2.3 *South Africa: Willem Pretorius Game Reserve, Tussen-die-Riviere Game Farm, Verwoerd Dam and other Orange Free State Nature Reserves; Suikerbosrand and other Transvaal Nature Reserves*

The South African highveld formerly supported enormous populations of black wildebeest, red hartebeest, blesbok, springbok and other species. Major representative examples of these highveld ungulate communities are protected in Willem Pretorius Game Reserve, Tussen-die-Riviere Game Farm and several nature reserves in the Orange Free State, and Suikerbosrand and other highveld nature reserves in the southern Transvaal. The

antelope populations of these relatively small, fenced reserves are carefully managed to prevent habitat overutilisation. Maintenance of the high standards of protection and management of these areas is of international importance, to ensure the persistence of representative highveld antelope communities.

3.3 *Karoo-Namib Regional Centre of Endemism*

This unit of sparsely inhabited semi-desert and desert is situated entirely within the Southern and South-central African region. The Namib is generally too arid for agriculture and livestock, but extensive sheep farming has modified large parts of the southern Karoo. Several conservation areas protect representative examples of the unit's antelope communities.

3.3.1 *Namibia: Namib-Naukluft Park, Skeleton Coast Park, Hardap Game Reserve*

The large size and high levels of protection and management of the Namib-Naukluft Park (recently enlarged to >49 000 sq km) make it the most important conservation area within this biogeographic unit. This park extends from coastal lagoons through gravel plains and sand dunes to the cliffs, canyons and platcaux of the Naukluft massif. It supports major populations of coastal desert and escarpment wildlife, including gemsbok, springbok, klipspringer and the largest surviving concentration of Hartmann's mountain zebra. Maintenance of the Namib-Naukluft Park's high conservation status is of great international importance to antelope conservation.

The Skeleton Coast Park protects the gravel plains and coastal dunes of the northern Namib, and contains significant populations of gemsbok and springbok. Hardap Game Reserve protects a dwarf shrub savanna antelope community, including species such as greater kudu, gemsbok, red hartebeest, steenbok and springbok. Both of these areas are well protected and are of international significance to antelope conservation.

3.3.2 *Angola: Iona National Park*

This large desert and semi-arid park is of major importance for ecosystem conservation within the unit. It contains substantial populations of gemsbok, Kirk's dikdik, steenbok and springbok, with smaller numbers of other species including black-faced impala (at least formerly). Although it is unprotected at present, Iona's vastness and isolation should ensure that viable remnants of most of its wildlife survive until it is possible for the Angolan authorities to re-establish effective protection. Improvement of the conservation status of this national park is an important priority in antelope conservation and should be given substantial international assistance.

3.3.3 *South Africa: Karoo National Park; Hester Malan, Akkerendam and other Cape Province Nature Reserves*

Karoo National Park, provincial (e.g., Hester Malan) and local authority (e.g., Akkerendam) nature reserves in the Cape Province protect internationally significant remnants of the antelope communities of Karoo-Namib semi-desert shrubland.

3.4 *Cape Regional Centre of Endemism*

This unit, which is most notable for its unique fynbos vegetation, is situated in the southwestern and southern Cape Province of South Africa. Characteristic antelopes of the area include species such as bontebok, Cape grysbok, and the extinct bluebuck. Bushbuck and blue duiker occur in the forests of the southern coast. Most of the Cape lowlands are now intensively farmed, but the uplands and mountains have been less modified by man. Numerous, generally small conservation areas protect examples of the area's natural habitats.

3.4.1 *South Africa: De Hoop, Cape of Good Hope and other Cape Province Nature Reserves; Cederberg and other Wilderness Areas; Bontebok National Park, Tsitsikamma Forest and Coastal National Parks*

The provincial (e.g., De Hoop Nature Reserve), local authority (e.g., Cape of Good Hope Nature Reserve), and State Forest (e.g., Cederberg Wilderness Area) protected areas of the southwestern and southern Cape, plus Bontebok and Tsitsikamma National Parks, protect important remnants of the unit's antelope communities. All of these areas currently receive high levels of protection and management.

3.5 *Afromontane Archipelago-like Regional Centre of Endemism*

Several conservation areas within the region protect important examples of the antelope communities of this biogeographic unit. Where required, international assistance should be provided to maintain the generally high conservation status of these areas.

3.5.1 *Malawi: Nyika National Park*

Nyika National Park includes the open, rolling grasslands of the Nyika Plateau and patches of evergreen forest in the valleys. It protects a major antelope community, including bushbuck, Natal red, blue and grey duikers, eland, southern reedbuck and roan.

3.5.2 *South Africa: Giant's Castle Game Reserve–Mkhomazi Wilderness Area and contiguous Wilderness Areas and Nature Reserves, Golden Gate Highlands National Park*

Giant's Castle Game Reserve and the contiguous wilderness areas and nature reserves protect a large area of the high altitude (1350 to >3000 m) grasslands and forest patches of the Natal Drakensberg, which support an important antelope community including a large eland population. Golden Gate Highlands National Park also protects an important example of a high altitude grassland antelope community, with blesbok and black wildebeest the most numerous species.

3.5.3 *Swaziland: Malolotja Nature Reserve*

This reserve is in a scenically spectacular area of Swaziland's northwestern highveld and supports an important high altitude grassland antelope community, including several reintroduced species which have become well established. The high standards of protection in Swaziland's conservation areas are an outstanding achievement for a small developing country. International assistance should be provided as necessary to ensure the long-term protection of these areas.

3.5.4 *Zimbabwe: Nyanga National Park–Mtarazi Falls National Park*

The Nyanga–Mtarazi Falls area protects patches of submontane and montane forest, open grasslands and heath-like scrub characteristic of Zimbabwe's eastern highlands. This area supports an internationally significant highland antelope community, including species such as bushbuck, blue duiker, grey duiker, southern reedbuck and sable. Poaching of duikers is a problem, especially of blue duiker in the forest below Mtarazi Falls.

3.6 *Zanzibar-Inhambane Regional Mosaic*

This coastal belt of relatively moist habitats extends from southern Somalia to the Limpopo River in southern Mozambique. Over half of the unit is within Mozambique. The relatively high human population density and widespread cultivation have reduced natural habitats and wildlife to scattered remnants.

3.6.1 *Mozambique: Marromeu Game Reserve–Zambezi Valley Wildlife Utilisation Unit*

The eastern part of the Zambezi Valley Wildlife Utilisation Unit, which incorporates Marromeu Game Reserve, includes Zambezi Delta floodplain grasslands and forest/savanna mosaics on higher ground. It contains one of the last major concentrations of wildlife within the entire Zanzibar-Inhambane unit, including large populations of waterbuck, southern reedbuck, oribi, Natal red duiker, suni and buffalo. Enhancement of the low conservation status of the Zambezi Valley Wildlife Utilisation Unit is an important priority in antelope conservation, and will require considerable international assistance.

3.7 *Tongaland-Pondoland Regional Mosaic*

This unit of coastal and coastal hinterland habitats extends from southern Mozambique to the eastern Cape Province of South Africa. It was originally covered by a forest/savanna mosaic, but most of the unit is now densely settled and has been converted to intensive agriculture. Several conservation areas in South Africa and Swaziland provide effective protection for important remnants of the unit's antelope communities.

3.7.1 *South Africa: Kruger National Park, Umfolozi Game Reserve–Corridor–Hluhluwe Game Reserve, Mkuzi Game Reserve*

The southern part of Kruger National Park and the major game reserves of Natal protect significant remnants of this unit's antelope communities, including species such as greater kudu, impala, Natal red duiker, grey duiker, waterbuck, blue wildebeest, suni, and/or nyala.

3.7.2 *Swaziland: Hlane Game Reserve*

Situated in Swaziland's northeastern lowveld, Hlane protects a significant antelope community, including substantial numbers of blue wildebeest and impala.

3.8 *Priorities for International Assistance*

Among six current (1986–87) site or country-specific approved World Wide Fund for Nature projects in Southern and South-central Africa, two are in Botswana, two in Zambia, and one in each of Malawi and Mozambique. These projects do not all relate directly to antelopes, but they include assistance to areas of high priority for antelope conservation, such as the Central Kgaligadi Game Reserve and the Luangwa Valley. Other funding sources also support conservation projects in the region. The relatively low number of WWF-funded projects compared to other regions such as East and Northeast Africa (27 comparable projects in 1986–87) partly reflects the capacity of several countries in Southern and South-central Africa to achieve high levels of protection and management of wildlife without international assistance.

The process by which conservation projects are developed and receive international funding is often complex and lengthy. This process must take account of political realities and countries' records in wildlife conservation. Within Southern and South-central Africa, Angola and Mozambique are the countries in greatest need of international assistance to strengthen the capabilities of their national authorities to identify, establish, protect and manage conservation areas, but these two countries have received little international assistance for wildlife conservation in recent years. This partly reflects political difficulties. Attempts should be made to increase the level of conservation assistance to these two countries, e.g., by increased recruitment of technical experts from countries which have diplomatic relations with the Governments of Angola and Mozambique (MacKinnon & MacKinnon 1986).

4. Captive Breeding

As an insurance against extinction, it is desirable to establish secure, self-maintaining captive breeding populations of antelopes whose survival in the wild is precarious. This may allow subsequent re-establishment of natural populations. As a result of the high capability for effective wildlife conservation in several countries within the region, the survival of only two antelopes, giant sable and Nyassa wildebeest, is immediately at risk in Southern and South-central Africa. The Nyassa wildebeest is extinct in Malawi and in danger of extinction in northern Mozambique, but it still occurs in large numbers outside the region, in southern Tanzania. In contrast, the giant sable is confined to the Kangandala-Luando area of northern Angola, where its status is probably declining because armed conflict and the insecurity of its natural range preclude completely effective protection at present. There are no known specimens of giant sable in captivity. Investigations should be conducted into the feasibility of assisting the Angolan conservation authority to establish a secure captive breeding population of giant sable elsewhere in the country as an immediate priority.

5. Strategies for Antelope Conservation

Effective strategies for antelope conservation must be developed to guide the implementation of the actions outlined above in sections 1 to 4.

5.1 *The Goal*

The broad objectives and requirements of the conservation of natural ecosystems in Africa are well documented (e.g., Cumming 1984; Lusigi 1984; MacKinnon & MacKinnon 1986). As part of overall environmental conservation, the goal of international antelope conservation (see chapter 1) should incorporate the maintenance in perpetuity of selected examples of the full range of African ecosystems which include major antelope communities. This will require a minimum set of properly managed and protected national parks of international significance, which can be used as the foundation for a network of diverse types of protected areas at the national level to further the maintenance of life support systems and sustainable development (Cumming 1984). In this regard, Southern and South-central Africa is in a relatively strong position compared to other regions of the continent, since it has a greater number of well managed and effectively protected parks and reserves of major international importance for the conservation of antelopes.

5.2 *The Problem*

It is widely held that the most critical issue confronting the long-term survival prospects of antelopes and other wildlife in Africa is the rapid growth of the continent's human population. An alternative view holds that while the human population is increasing very rapidly, the overall ecological situation remains satisfactory, with considerable room for further human increase without ecological collapse, elimination of major biotic communities, or extinction of many species (Bell 1987).

Elimination of most wildlife has occurred locally in areas of high human population density within Southern and South-central Africa, resulting in local extinctions (e.g., Lesotho) or the restriction of most species of large mammals to protected areas (e.g., Malawi). Relatively undisturbed natural biotic communities remain in extensive areas of the region with sparse human populations, particularly in and around conservation areas. The long-term future of most large mammals outside proclaimed conservation areas is probably precarious, as much of this land will be required for other uses (e.g., EEC-funded tsetse eradication schemes schemes planned for large areas of Zambia, Zimbabwe and Mozambique will enable further expansion of human settlement), but the protected area system is large and generally representative of the region's major antelope habitats. Maintenance and, where

necessary, improvement of the protection and management of this system should ensure the long-term survival of adequate representative examples of the region's antelope communities. This is likely to require increased efforts to reduce the conflict between short-term individual interests and long-term communal interests, and to balance the costs and benefits of conservation equably between different sectors of the community, international, national and local (Bell 1987).

Attempts to conserve wildlife by establishing strictly protected conservation areas without active consultation with local communities may be successful in the short term, but this approach results in escalating conflicts between people and wildlife, especially on reserve boundaries. Most conservation areas will be engulfed sooner or later by the needs of local human populations unless the requirements of local people and wildlife can be reconciled. Essentially, this requires compromise between the aesthetic ideals of conservationists and the shorter-term economic motives of rural people (Bell 1986a). According to Boshe (1986) there needs to be less emphasis on guns and paramilitary personnel to enforce conservation laws, and greater emphasis on the creation and enhancement of public support for wildlife conservation. Both approaches, however, may be necessary.

In many cases, enhancement of public support will require direct participation of local people in conservation decisions and some utilisation of natural resources within protected areas, preferably in buffer zones around core areas of high conservation priority. Conservation cannot be expected to compete successfully on economic terms with other forms of land use, since conservation and short-term economic interests are fundamentally in conflict (Bell 1986a). From a conservation viewpoint, the maxim that wildlife must pay its way or be eliminated is false, as it renders conservation areas vulnerable to any alternative form of land use which is more profitable (Eltringham 1984; Bell & Clarke 1986). Nevertheless, local communities (as well as central governments) must benefit materially from wildlife conservation, at least in the short term, if it is to succeed. National conservation agencies must attempt to reconcile their objectives with short-term economic interests, and encourage generation of material benefits for local rural people by any means that do not conflict with conservation goals (Bell & Clarke 1986).

5.3 *Options for Antelope Conservation*

5.3.1 *Strict Protection*

There will remain a central core of high priority areas, such as some of those of outstanding international importance for the conservation of antelopes, where little compromise with short-term economic motives is possible if conservation goals are to be attained (Bell 1986a). Strict protection and effective management will be necessary in these core areas. Improved techniques of monitoring and law enforcement by game scouts are necessary in some countries if wildlife resources are to be conserved efficiently, and in a manner which is responsive to the needs of local people (Bell 1986b; Chinzinga 1986). There is a significant body of opinion that African wildlife will only survive in the long term within strictly protected conservation areas (e.g., Parker 1984; Spinage 1986).

5.3.2 *Public Support for Conservation*

Public consent and support for conservation are essential if strictly protected core conservation areas are to persist in the long term. Education and sociological research on conservation issues are therefore just as important as improved methods of enforcing conservation laws. Conservation education has a vital role to play in promoting more positive attitudes to wildlife and greater awareness of the benefits of conservation. Continued international financial support for education programmes, such as the Chongololo Clubs and Conservation Clubs operating in Zambia's schools, and Swaziland's National Environmental Education Programme, is therefore an important priority. As well as educating the school population, it is important to increase the conservation awareness of today's leaders and decision-makers (Sefu 1986).

There is also a need for much higher priority to be given to sociological aspects of wildlife conservation research, e.g., monitoring of public attitudes (Bell 1986c). As Eltringham (1984) and others have pointed out, conservation research has concentrated on the biology of plants and animals, but sociological research is equally important to provide the means of reconciling the needs of people and wildlife.

Conservation education and public relations programmes are likely to require skilled and dedicated effort by conservationists over a long period to achieve increased public support for strictly protected conservation areas. Carefully controlled consumptive uses of wildlife and other natural resources within conservation areas and/or their buffer zones may have more immediate success in promoting positive attitudes to wildlife conservation among rural populations (e.g., Boshe 1986; Mphande 1986; Nzima 1986). Options for revenue-generating/consumptive use of antelope populations include tourism and sustained-yield utilisation (game farming on fenced land, game cropping in unmodified natural ecosystems, subsistence hunting, and multiple resource use). These options were briefly reviewed in the Regional Action Plan for Antelope Conservation in East and Northeast Africa (in East 1988), which emphasized the need to identify the factors likely to produce successful utilisation *and* conservation of natural ecosystems, and to make these guidelines available to African government departments responsible for the management of natural resources.

5.3.3 *Local Participation in Conservation Planning*

Land-use planning, identification of attainable conservation objectives, and minimising conflicts of interest between wildlife conservation and other activities require planning inputs from all of the parties involved, from central government to local communities (Bell 1987). The importance of local participation is highlighted by some countries' adoption of legislation which gives landowners control and use rights or ownership of at least the more common game animals on their land. This has led to the growth of the large and lucrative game industry on private land in Namibia and South Africa and on commercial farming land in Zimbabwe. The challenge now is to bring the peasant economy sector into the wildlife utilisation industry (Martin 1986a).

Two major projects currently in progress within the region may provide blueprints for the development of land-use plans which successfully integrate wildlife utilisation with agricultural development. The Communal Area Management Plan for Indigenous Resources in the Sebungwe district of Zimbabwe includes restriction of farming to fenced areas on the better arable soils, avoidance of overstocking of domestic animals, establishment of buffer zones between conservation and farming areas for controlled exploitation of surplus wildlife populations, and the formation of companies by local residents for ownership and control of natural resources on a communal basis, within limits set by the Government (Martin 1986b). A similar approach is being adopted in part of Zambia's Luangwa Valley. The Luangwa Integrated Resource Development Project aims to increase the living standards of the people in the project area through sustainable use of the area's rich natural resources (agriculture, forestry, wildlife and water), with village organisations controlling the use of resources such as wildlife (Bell & Lungu 1986). The success of these projects in reducing or eliminating the conflict between rural people and wild animals, and providing incentives for local people to dis-

courage illegal offtake of wildlife, could have major implications for the future direction of wildlife conservation in Southern and South-central Africa and elsewhere.

5.4 *Conclusions*

Most antelope species in Southern and South-central Africa still occur in substantial populations, at least locally. The long-term persistence of these species within the region will require effective conservation of the ecosystems in which they occur. The most appropriate and feasible strategy for antelope conservation in particular, and the conservation of natural ecosystems in general, will depend on local circumstances and opportunities. Strict protection of core conservation areas and consumptive utilisation of antelopes by rural populations may both play important roles in the development of successful long-term conservation strategies. In its role as a scientific advisory group, the Antelope Specialist Group should continue to monitor the status of antelopes, highlight problems of antelope conservation, recommend practical solutions, and monitor the success of attempts to integrate wildlife conservation with development.

References

Bell, R.H.V. 1986a. Problems in achieving conservation goals. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 31–41. Washington DC, US Peace Corps.

Bell, R.H.V. 1986b. Monitoring of illegal activity and law enforcement in African conservation areas. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 317–351. Washington DC, US Peace Corps.

Bell, R.H.V. 1986c. Monitoring of public attitudes. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 441–449. Washington DC, US Peace Corps.

Bell, R.H.V. 1987. Conservation with a human face: conflict and reconciliation in African land use planning, pp. 79–101. *In* Anderson, D.; Grove, R. (Editors). Conservation in Africa. Cambridge, Cambridge University Press.

Bell, R.H.V.; Clarke, J.E. 1986. Funding and financial control. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 543–555. Washington DC, US Peace Corps.

Bell, R.H.V.; Lungu, F.B. 1986. The Luangwa Integrated Resource Development Project. Progress of phase I and proposals for phase II. Chipata, LIRDP.

Boshe, J. 1986. Wildlife law enforcement in Africa. *Swara* 9(2): 8–10.

Chinzinga, B.A. 1986. Law enforcement progress in Kasungu National Park. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 371–380. Washington DC, US Peace Corps.

Cumming, D.H.M. 1984. Toward establishing priorities for funding and other international support for protected areas in Africa. *In* Proceedings of the 22nd Working Session of Commission on National Parks & Protected Areas, Victoria Falls, Zimbabwe, 22–27 May 1983, pp. 108–111. Gland, IUCN.

East, R. (Compiler). 1988. Antelopes: global survey and regional action plans. Part 1: East & Northeast Africa. Gland, IUCN.

Eltringham, S.K. 1984. Wildlife resources and economic development. Chichester & New York, Wiley.

Lusigi, W.J. 1984. The Victoria Falls Action Plan: a regional programme for IUCN support to protected areas in Africa. *In* Proceedings of the 22nd Working Session of Commission on National Parks & Protected Areas, Victoria Falls, Zimbabwe, 22–27 May 1983, pp. 114–120. Gland, IUCN.

MacKinnon, J.; MacKinnon, K. 1986. Review of the protected areas system in the Afrotropical realm. Gland and Cambridge, IUCN.

Martin, R.B. 1986a. Wildlife utilisations. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 219–231. Washington DC, US Peace Corps.

Martin, R.B. 1986b. Communal area management plan for indigenous resources (project CAMPFIRE). *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 279–295. Washington DC, US Peace Corps.

Mphande, J.N.B. 1986. Wildlife conservation and management in Malawi: for whom? *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 451–460. Washington DC, US Peace Corps.

Nzima, H.E. 1986. Law enforcement and public relations: a case history. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 381–385. Washington DC, US Peace Corps.

Parker, I.S.C. 1984. Conservation of the African elephant. *In* Cumming, D.H.M.; Jackson, P. (Editors). The status and conservation of Africa's elephants and rhinos, pp. 69–77. Gland, IUCN.

Sefu, L.D. 1986. The role of the Environmental Unit of the Department of National Parks and Wildlife, Malawi. *In* Bell, R.H.V.; McShane-Caluzi, E. (Editors). Conservation and wildlife management in Africa, pp. 431–439. Washington DC, US Peace Corps.

Spinage, C.A. 1986. The natural history of antelopes. London, Croom-Helm.

APPENDIX 1: ANTELOPE INVENTORY REPORT FORM

1. *Species/Subspecies/Population*
2. *Country*
3. *Date*
4. *Reporter*
   Name:
   Address:
5. *Distribution*
   Present:
   Former:
   (To save words, include a distribution map)
6. *Population*
   Estimated numbers in the wild (if counts or samples have been made, summarize data)
   Are numbers increasing, decreasing or stable?
7. *Field Studies*
   Has the species/subspecies/population been studied in the country in question?
   If yes, by whom; please cite publications or reports under 13, References
8. *Habitat, Food and Reproduction*
   a) Brief description of habitat and food preferences
   b) Any data on average group size and dispersion pattern
   c) Movements—e.g., migratory/nomadic, wet-season dispersion, dry-season aggregation, or sedentary
   d) Reproduction—times of calving, mating (including peaks if any)
9. *Status*
   Is the status of the animal:
   a) presently satisfactory?
   b) threatened, and if so why, e.g., habitat destruction, overexploitation, hybridization, natural disasters, competition for food, or other causes
10. *Conservation Measures Taken*
    Legal measures (international conventions, national laws). To what extent are laws enforced?
    Protected areas—does it occur in national parks, reserves, etc.? If so, please name. Does it also occur outside?
    Have any specific conservation/management plans been proposed or implemented?
11. *Conservation Measures Proposed*
    What is required to conserve the population(s) in question?
12. *Additional Remarks*
13. *References*
    Published papers, unpublished reports, manuscripts, written (in litt.) or verbal communication (pers. comm.)

APPENDIX 2: ANTELOPES CURRENTLY OR POTENTIALLY AT RISK IN SOUTHERN AND SOUTH-CENTRAL AFRICA

This summary divides antelopes whose survival is currently or potentially at risk in Southern and South-central Africa into:

species and highly distinct subspecies which are largely or entirely confined to the region;
species and highly distinct subspecies which occur elsewhere in Africa but are represented by internationally significant populations within the region;
species which occur only marginally within the region.

Within each of these groupings, antelopes are divided further into those which are under immediate threat (currently in danger of extinction throughout the region, or likely to become in danger of extinction in the near future if the causal factors continue to operate), and those which are potentially at risk (i.e., antelopes which have a very restricted distribution and/or inadequate representation in conservation areas, but whose survival within the region is not under immediate threat).

Endemic Antelopes Under Immediate Threat

Giant Sable (*Hippotragus niger variani*)

The giant sable is the only endemic antelope under immediate threat in the region. It is confined to a small area of northern Angola, in and around Kangandala National Park and Luando Natural Integral Reserve. The population was estimated to be about 2–3000 in 1969–70 but is believed to have declined since because of lawlessness and armed conflict, which have affected its range over the last decade. Apart from poaching and disturbance by military operations, the major long-term threat to the giant sable is the large, increasing human population within the Luando Reserve and Kangandala National Park. The needs of local people will eventually result in large-scale degradation of the giant sable's woodland habitat unless the area's human and wildlife populations are separated. Key recommendations to ensure the giant sable's future include the establishment of a Giant Sable National Park incorporating the existing Kangandala National Park, part of the Luando Reserve and the area between the park and the reserve, and exclusion of settlement, livestock, cultivation and woodcutting. Sufficient land for human exploitation would have to be provided outside this proposed national park to satisfy the needs of the present population for cultivation, building materials and fuel. Utilisation of peripheral sable herds outside the national park could be organised to provide economic benefits to the local people, e.g., through carefully controlled trophy hunting and establishment of a giant sable breeding station to provide animals for sale to overseas zoos.

Implementation of these recommendations will not be possible until political stability and law and order are re-established within the area. As an immediate priority, investigations should be conducted into the feasibility of assisting the Angolan conservation authorities to establish a secure captive breeding population of giant sable outside its natural range. At present, there are no known specimens in captivity. The giant sable has major symbolic significance to antelope conservation. It is often considered to be the most spectacular of all the antelopes, and is used as the symbol of wildlife conservation in Angola and as the emblem of the IUCN/SSC Antelope Specialist Group.

Endemic Antelopes Potentially at Risk

Red Lechwe (*Kobus leche leche*)

The red lechwe, which is near-endemic to the region, formerly occurred on floodplains of the upper Zambezi and Kafue Rivers and scattered locations elsewhere in northern and western Zambia, extending into neighbouring Zaire (where it is now close to extinction), Angola, Namibia (Caprivi Strip) and northern Botswana (Okavango Delta and Linyanti Swamp). Uncontrolled hunting has reduced it to scattered remnants within its original range. The total population exceeds 30 000, with the bulk of the surviving animals in the Okavango (>20 000). Major protected populations occur in Moremi Game Reserve (Botswana) and on the Busanga Plain in the north of Kafue National Park (Zambia). It was formerly common in the Luando, Mavinga and Luiana Reserves in Angola, but its current status in these areas is unknown. The population on the Chobe River floodplain in Chobe National Park (Botswana) has declined to low levels, probably because of overgrazing of the floodplain and heavy hunting offtake when the animals move outside the park. The red lechwe's long-term survival depends on effective protection of the major surviving populations against illegal hunting, and continued preservation of substantial areas of its floodplain habitat in the face of increasing pressures to develop areas such as the Okavango, e.g., for expansion of the cattle industry and large-scale water removal for agricultural and mining schemes.

Kafue Lechwe (*Kobus leche kafuensis*)

This lechwe is confined to the Kafue Flats floodplain in Zambia, where its survival is potentially threatened by alteration of the natural flooding regime by the operation of hydroelectric dams on the Kafue River at either end of the Kafue Flats. This could severely reduce the carrying capacity of the floodplain for lechwe, and may interfere seriously with the subspecies' social behaviour. Poaching is also a potential threat to this antelope's survival. The population was estimated to number 90–95 000 in 1970–72, prior to the closure of the dams, and subsequently declined by more than 50%. Numbers appeared to stabilise at about 41 000 between 1981 and 1983, and were estimated to be 50 700 in 1987. The distribution of lechwe on the Kafue Flats has changed little since the dams were closed, with the bulk of the population within or near Blue Lagoon and Lochinvar National Parks. The long-term effects of the dams on lechwe numbers cannot yet be predicted, e.g., it is possible that the population reached an historical peak in the early 1970s, followed by a natural population crash which may have occurred regardless of the construction and operation of the dams. It is essential that regular monitoring of the Kafue lechwe population is continued to assess trends and provide a quantitative basis for management of the population.

Black Lechwe (*Kobus leche smithemani*)

The black lechwe occurs mainly on the floodplains of the Bangweulu Basin, Zambia, with small numbers on the upper Chambeshi River in northern Zambia where it was reintroduced in 1975. The Bangweulu population had declined to about 16–17 000 by the late 1960s but has subsequently increased, reaching about 25 000 in 1973 and 41 000 in 1983. Most of the subspecies' current range is within game management areas. The pre-1970 population decline was apparently caused primarily by a rise in water levels which resulted from tectonic tilting of the Bangweulu Basin floor. This may have caused the carrying capacity to fall below the threshold at which the prevailing hunting offtake was sustainable, resulting in a population collapse unaccompanied by either symptoms of overstocking or an unequivocal increase in hunting offtake. The population's recovery since 1970 is probably due to reduced hunting pressure because of emigration of people from the area and hunting becoming less cost-effective.

While the black lechwe population is currently increasing and is under no immediate threat, its distribution is very restricted and it remains potentially vulnerable to uncontrolled hunting and natural or human-induced alterations to water levels. As recognised in Zambia's National Conservation Strategy, lechwe populations have high potential for protein production from floodplains where conventional agriculture is severely restricted. Sustainable utilisation of black lechwe in the Bangweulu Basin and Kafue lechwe on the Kafue Flats should be developed and integrated with other forms of land use to provide the maximum long-term benefits to local people.

Bontebok (*Damaliscus dorcas dorcas*)

Historically confined to the coastal plain of the southwestern Cape Province, South Africa, where it was formerly abundant, the bontebok was almost exterminated by hunting. It was saved from extinction in the mid-19th century by a few Cape farming families who protected the small remnant populations. Since the proclamation of the original Bontebok National Park in 1931, this antelope's numbers have gradually increased. The total population exceeded 800 in 1969 and is now >1500. It remains potentially at risk because of its relatively small population, but is well out of danger as long as numbers continue to increase and it is well protected in conservation areas and on private farmland. The main protected populations are in Bontebok National Park (numbers maintained at about 300) and De Hoop Nature Reserve (population about 400).

Cookson's Wildebeest (*Connochaetes taurinus cooksoni*)

This subspecies is endemic to the Luangwa Valley, Zambia, where it is common on the valley floor (total population about 10 000). Individuals occasionally wander onto the adjacent plateau and have been recorded in western Malawi. It is potentially at risk because of its localised distribution, but almost all of its range lies within conservation areas (North Luangwa National Park, Luambe National Park, the Nsefu sector of South Luangwa National Park, and contiguous game management areas) and it is secure as long as these areas are maintained.

Black Wildebeest (*Connochaetes gnou*)

The black wildebeest formerly occurred in enormous numbers on the highveld grassland of the interior plateau of South Africa and adjacent areas. By the late 19th century, excessive hunting had reduced it to a few surviving animals on two farms in the Orange Free State. Protection by concerned farmers, and subsequently by provincial and national conservation authorities, has enabled the species to recover from the brink of extinction. It has been widely reintroduced to conservation areas and private farmland within its former range, and to farmland outside its natural range. It is not at risk as long as it continues to receive effective protection. The total population now numbers well into the thousands, with the largest numbers in the Orange Free State (7000 in 1985–86, compared to 1900 in 1970–71) and >1000 in the Transvaal. There are >3000 black wildebeest in provincial nature reserves in South Africa, and well over 300 (in total) in three national parks (Golden Gate Highlands, Mountain Zebra and Karoo). The species is also well represented in some local authority nature reserves in South Africa and in Malolotja Nature Reserve, Swaziland.

Black-faced Impala (*Aepyceros melampus petersi*)

Confined to mopane savanna and bushland in northwestern Namibia and southwestern Angola, the black-faced impala has

suffered a marked reduction in numbers and contraction of its distribution since the 1920s. This has been caused mainly by excessive hunting. It is potentially at risk because of its small numbers and restricted distribution, but its numbers are now increasing in Namibia with effective protection in Etosha National Park (population about 350 and increasing) and on private farmland (total numbers >500 and increasing). Its current status is unclear in Angola, where it formerly occurred in Iona National Park (which is unprotected at present) and a few other conservation areas.

Widespread Antelopes Under Immediate Threat Within the Region

Nyassa Wildebeest (*Connochaetes taurinus johnstoni*)

The Nyassa wildebeest was formerly abundant in eastern Malawi (Palombe plains around Lake Chilwa) and parts of northern Mozambique. It was exterminated in Malawi in the 1930s and the Palombe plains are now densely settled. Uncontrolled hunting has eliminated the Nyassa wildebeest from most of its former range in Mozambique, where it is now in danger of extinction in the short term (population no more than a few hundred and declining). It occurs in Niassa Game Reserve (population about 200 in 1977; present situation unknown) and Gile Game Reserve (on the verge of extinction). Improvement of the protection and management of Niassa Game Reserve, including proposals to develop the area into Rovuma National Park, may offer the best prospects for preventing this wildebeest's extinction within the region, but this is precluded at present by political instability. The subspecies is still common and reasonably secure within Selous Game Reserve and Mikumi National Park in southern Tanzania.

Widespread Antelopes Potentially at Risk Within the Region

Blue Duiker (*Cephalophus monticola*)

The blue duiker occurs locally within the region in suitable habitat of montane and moist forests and coastal thicket. It is often regarded as rare and very localised, but this may be partly because it is difficult to observe because of its small size, secretive habits and preference for cover. The greatest threats to its survival are destruction of its forest habitat and poaching. It occurs in moderate to substantial numbers in several protected areas within the region, e.g., Kisama National Park (Angola), West Lunga, Kafue and Nsumbu National Parks (Zambia), Nyika National Park, South Viphya and other Forest Reserves (Malawi), Chimanimani and Nyanga-Mtarazi Falls National Parks (Zimbabwe), Tsitsikamma and Zuurberg National Parks and coastal nature reserves in Natal and the southeastern Cape Province (South Africa). At least some of these populations appear to have increased in recent years with effective protection, e.g., in the Tsitsikamma forests. The species is probably secure within the region as long as the conservation areas within which it occurs are maintained. Prevention of human encroachment and the effective control of illegal hunting in forest reserves may be particularly important to ensure the long-term survival of this duiker and other forest biota. There is a need to increase the awareness of some countries' forest departments of the importance of forest reserves to wildlife conservation.

Yellow-backed Duiker (*Cephalophus silvicultor*)

This duiker reaches the southern limits of its continental distribution in moist forests and thickets in northern Angola and western Zambia. Its survival within the region may be at risk in the long term from habitat destruction and poaching. The Zambian populations, at least, are of international significance for the long-term survival of this species. It has been recorded from several Zambian national parks, with significant populations in at least two parks (West Lunga and Kafue).

Roan (*Hippotragus equinus*)

Formerly widespread in the plateau *Brachystegia* woodlands and some savanna grasslands at lower elevations in Southern and South-central Africa, this species has been eliminated by overhunting from large areas of its natural range. It may have also suffered from habitat degradation caused by overgrazing in some areas. It is now rare and occurs mainly in and around conservation areas. Moderate to substantial populations (several hundred to a few thousand individuals) occur in several protected areas within the region, such as Kafue National Park (Zambia), Nyika and Kasungu National Parks and Vwaza Marsh Game Reserve (Malawi), Waterberg Plateau Park (Namibia), Chobe National Park (Botswana), Hwange National Park (Zimbabwe) and Kruger National Park (South Africa). The long-term survival of roan within the region depends on the maintenance of effective protection and management of the conservation areas which support viable populations.

Antelopes Which Occur Marginally Within the Region

Bay Duiker (*Cephalophus dorsalis*) and Black-fronted Duiker (*C. nigrifrons*)

Within the region, these two duikers are confined to patches of moist forest in northern Angola, where their numbers are unlikely to be large. Like other forest wildlife in northern Angola, they are potentially at risk, at least in the long term, from habitat destruction through uncontrolled logging, the encroachment of settlement, excessive hunting, and the lack of protected areas. Both species are more widespread and common elsewhere in their ranges.

Other IUCN/SSC Action Plans for the Conservation of Biological Diversity

1. Action Plan for African Primate Conservation: 1986–1990. Compiled by J. F. Oates and the IUCN/SSC Primate Specialist Group, 1986, 41 pp., £ 7.50, U.S.$ 15.00.
2. Action Plan for Asian Primate Conservation: 1987–1991. Compiled by A. A. Eudey and the IUCN/SSC Primate Specialist Group, 1987, 65 pp., £ 7.50, U.S.$ 15.00.
3. Antelopes. Global Survey and Regional Action Plans. Part 1. East and Northeast Africa. Compiled by R. East and the IUCN/SSC Antelope Specialist Group, 1988, 96 pp., £ 7.50, U.S.$ 15.00.
4. Dolphins, Porpoises, and Whales. An Action Plan for the Conservation of Biological Diversity: 1988–1992. Compiled by W. F. Perrin and the IUCN/SSC Cetacean Specialist Group, 1988, 28 pp., £ 5.00, U.S.$ 10.00.
5. The Kouprey. An Action Plan for its Conservation. Compiled by J. R. MacKinnon, S. N. Stuart, and the IUCN/SSC Asian Wild Cattle Specialist Group, 1989, 19 pp., £ 5.00, U.S.$ 10.00.
6. Weasels, Civets, Mongooses and their Relatives. An Action Plan for the Conservation of Mustelids and Viverrids. Compiled by A. Schreiber, R. Wirth, M. Riffel, H. van Rompaey, and the IUCN/SSC Mustelid and Viverrid Specialist Group, 1989, price to be determined.

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