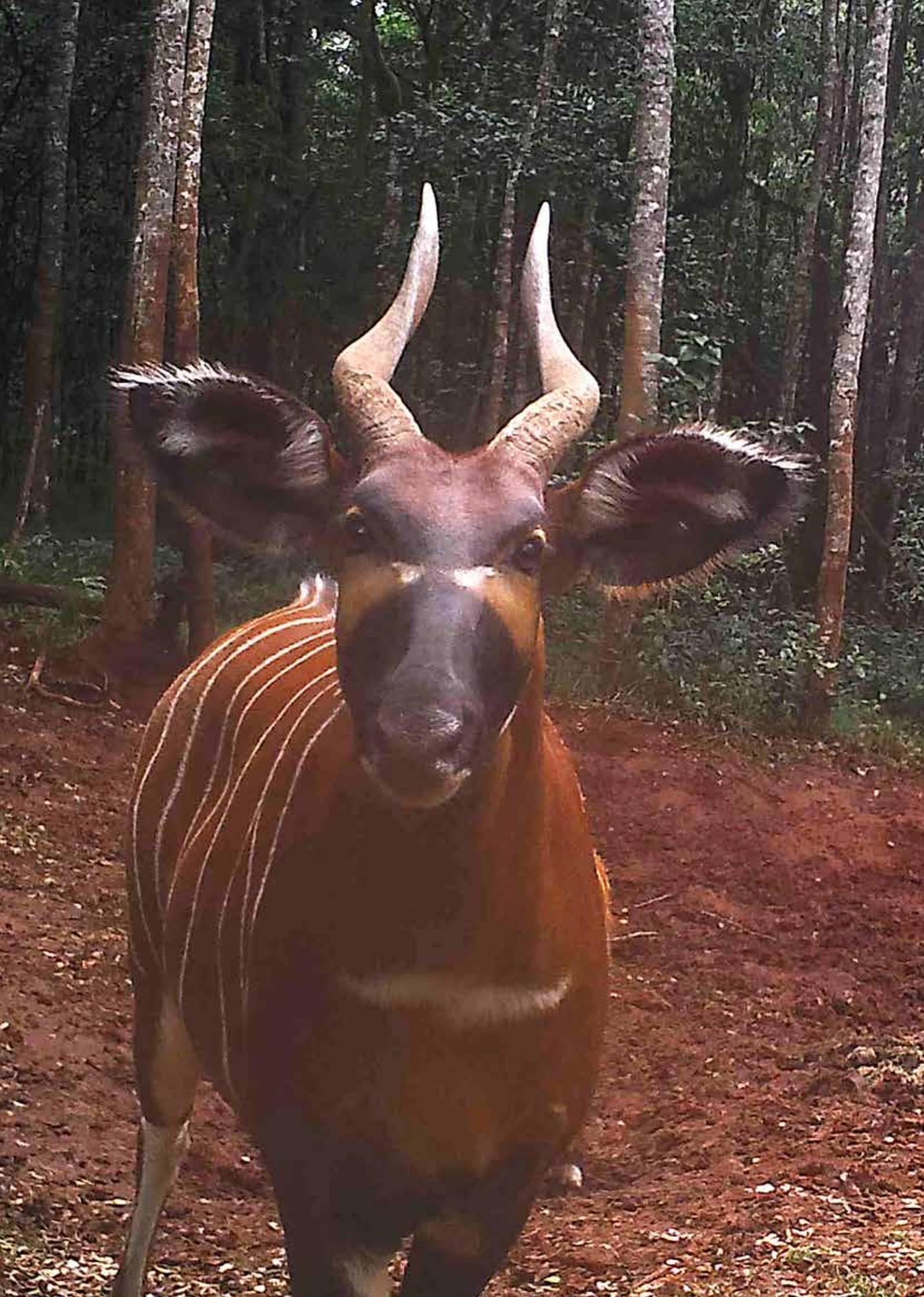


**NATIONAL RECOVERY
AND ACTION PLAN FOR THE
MOUNTAIN BONGO**
(Tragelaphus eurycerus isaaci)
IN KENYA (2019-2023)





**NATIONAL RECOVERY
AND ACTION PLAN FOR THE
MOUNTAIN BONGO**
(Tragelaphus eurycerus isaaci)
IN KENYA (2019-2023)

Table of Contents

Foreword	5
Preface	6
Acknowledgements	7
Abbreviations	8
Executive Summary	9
Chapter 1	10
Introduction	10
Chapter 2	11
Status Of Mountain Bongo (<i>Tragelaphus eurycerus isaaci</i>) In Kenya	11
Mountain Bongo - Scientific Classification	11
Feeding ecology of the bongo	11
Historical Distribution	13
Current Distribution And Status	15
Chapter 3:	18
Threats To Conservation Of Mountain Bongo In Kenya	18
Introduction	18
Proximate and ultimate threats	19
Chapter 4	20
Recovery And Action Plan For The Mountain Bongo In Kenya	20
Background	20
Mountain Bongo National Action Plan	24
Strategic Objective 1	25
Security: To Secure Wild Bongo Populations.	25
Strategic Objective 2	27
Human Activities: To Manage Legal Activities, Stop Illegal Human Activities That Destroy Mountain Bongo Habitat to Ensure Sustainability.	27
Strategic Objective 3	28
Small Populations: To Use Novel Technologiesto Address the Vulnerability of Small and Isolated Bongo Populations.	28
Strategic Objective 4	31
Communities: Optimise The Participation of Communities Living Adjacent to Bongo Habitat in Bongo Conservation.	31
Strategic Objective 5	35
Policy Harmonization: To Ensure Policies Enhance Conservation Efforts for Mountain Bongos and Their Habitats.	35
Strategic Objective 6	36
Law Enforcement and Prosecution: To Enhance Law Enforcement and Prosecution Through Engagement of Relevant Security Agencies, Office of the Director of Public Prosecutions and The Judiciary.	36
Strategic Objective 7	37
Species Interaction: To Minimise the Negative Impacts of Other Species, on Bongo.	37
Strategic Objective 8	38
Disease: To Optimise the Assessment and Management of Disease Risk to Wild Bongos.	38
Chapter 5	40
Implementation of the National Recovery and Action Plan	40
Appendix 1: Strategic Objectives With Prioritisation Scores	42
Appendix 2: Strategic Plan Logical Framework	45
Appendix 3: Identification, Monitoring, Body Scoring of Bongos	53
References	59

Foreword



Safeguarding our valuable wildlife resources for current and future generations is one of the agenda for the government today. Kenya's wildlife population is in a decline, with an average loss of 68% over the last 40 years. There are 33 mammalian, 28 avian and 356 plant species in Kenya under threat. These wildlife species population losses are driven by a combination of factors including, climate and land use changes, habitat loss and fragmentation, poaching, illegal trade, and human-wildlife conflict.

Goal 2 of the National Wildlife Strategy (NWS) 2030, aims at enhancing species protection and management through the conservation of endangered and threatened species. It provides for the development, adoption and implementation of policy guidelines on species specific conservation interventions including captive breeding, introduction, reintroductions, and translocations

of the endangered species. The Wildlife Conservation and Management Act, 2013, Section 49 prescribes development and implementation of species specific recovery plans for all species listed in the sixth schedule such as the Mountain bongo.

The Eastern or Mountain Bongo, (*Tragelaphus eurycerus isaaciis*) is classified by the International Union for Conservation of Nature (IUCN) as one the Critically Endangered species, with more individuals in captivity than in the wild. The decline in bongo population has been attributed to various reasons that include habitat fragmentation, poaching, predation, disease and other human induced factors. In Kenya, significant bongo numbers are now mainly confined to the Aberdare and Maasai Mau Forests.

This strategy aims to re-establish a viable mountain bongo population in its native habitat. It recognizes the threats facing the species and provides guidance to efforts aimed at their conservation and management. This will be achieved through a set of objectives and activities outlined in the strategy that help address information generation and management; community Involvement; education and awareness; policy and law enforcement and coordination.

The Ministry of Tourism & Wildlife recognizes and appreciates the input and efforts of all stakeholders in the conservation and management of mountain bongos in Kenya. Successful implementation of this strategy is imperative and will require synergy of conservation efforts by all relevant stakeholders so as to ensure that the species populations and habitats are restored.

A handwritten signature in black ink, appearing to read 'Najib Balala', written over a faint circular stamp or watermark.

HON. NAJIB BALALA, EGH

CABINET SECRETARY

MINISTRY OF TOURISM AND WILDLIFE

Preface



This National Recovery and Action Plan for the Mountain Bongo was developed through a collaborative process involving a team of technical officers, conservation managers from governmental and nongovernmental organizations, community representatives amongst other stakeholders with the primary purpose of reversing the mountain bongo decline in Kenya.

The mountain bongo population has declined from approximately 500 individuals in the 1970's to just under 100 individuals confined to Aberdare, Mount Kenya, Eburu, Maasai Mau and South Western Mau forests.

Implementation of this strategy will be guided by a vision, goal and eight broad strategic objectives that cover security enforcement, control of both legal and illegal human activities, use science-based methodologies, optimize the participation of communities living adjacent to bongo habitat in bongo conservation actions, to ensure policy issues that slow down conservation efforts for mountain bongos and their habitats are harmonized, to enhance

law enforcement and prosecution through engagement of relevant security agencies, to optimize the assessment and management of disease risk to wild bongos, and to minimize the negative impacts of other species, on bongo.

The urgency to put in place measures for the conservation of this species cannot be overemphasized due to the accelerated decline in mountain bongo population. Successful implementation of the strategy is imperative and will require concerted efforts of relevant government agencies, conservation NGO's, communities and research institutions so as to ensure that the species populations and habitat is restored.

I invite all stakeholders to join in realizing our collective goal of securing the mountain bongo for the benefit of all.

A handwritten signature in blue ink, appearing to read 'Susan J. Koeh'.

DR. SUSAN J. KOECH

PRINCIPAL SECRETARY

STATE DEPARTMENT FOR WILDLIFE

Acknowledgements



Kenya Wildlife Service is thankful to the many organizations and institutions that ensured that the production and launch of the Mountain Bongo National Recovery and Action Plan was realized. Special thanks go to the Cabinet Secretary for Tourism and Wildlife, Hon. Najib Balala, EGH and the Principal Secretary, State Department of Wildlife, Dr. Susan Koech for their respective approvals and guidance during the Plan finalization and launch process. I also thank the Kenya Wildlife Service Board of Trustees for approving the Recovery Plan.

The formulation process and launch of the Recovery and Action Plan could not have been possible without the partnership of several organizations including the International Union for Conservation of Nature (IUCN)/Species Survival Commission (SSC); Conservation Breeding Specialist Group Woburn Safari Park (UK); Mount Kenya Wildlife Conservancy and Rhino Ark.

Last but by no means least, I wish to appreciate the Kenya Forest Service, community representatives, conservation Non-Governmental Organizations, research institutions, specific project personnel, and other national government representatives for participating in the three-day consultative workshop that was held in 2010 at Nyeri town. The outstanding work done by the members of the National Bongo Task Force in reviewing, updating and finalization of the Recovery and Action Plan is truly appreciated. I wish to request all the stakeholders to continue engaging as we now move to the implementation phase so as to ensure sustainable conservation of the Mountain Bongo in Kenya.



BRIG. (RTD) J.M. WAWERU, EBS. 'NDC' (K), 'PSC' (K)
DIRECTOR GENERAL, KENYA WILDLIFE SERVICE



The Mountain Bongo National Recovery and Action Plan was compiled by the National Bongo Task Force

Abbreviations

ANP	Aberdare National Park
AZA	American Association of Zoos and Aquariums
BSP	Bongo Surveillance Project
CBO	Community Based Organisation
CFAs	Community Forest Associations
CITES	Convention on International Trade of Endangered Species of Flora and Fauna
DNA	Deoxyribonucleic acid
DRSRS	Department of Resource Surveys and Remote Sensing
DVO	District Veterinary Officer
EA	Environmental Audit
EAZA	European Association of Zoos and Aquaria Zoos
EEP	European Endangered Species Programme
EIA	Environmental Impact Assessment
HVS	Head Veterinary Services
IBF	International Bongo Foundation
ICIPE	International Centre for Insect Physiology and Ecology
ICRAF	International Centre for Research in Agroforestry
ILRI	International Livestock Research Institute
IPZ	Intensive Protection Zone
ISB	International Studbook
IUCN	International Union for Conservation of Nature
KACC	Kenya Anti-Corruption Commission
KBC	Kenya Broadcasting Corporation
KEFRI	Kenya Forestry Research Institute
KENGEN	Kenya Electricity Generating Company Limited
KFS	Kenya Forest Service
KWS - DVS	Kenya Wildlife Service, Department of Veterinary Services
KWS	Kenya Wildlife Service
LWF	Laikipia Wildlife Forum
MKT	Mount Kenya Trust
MKWC	Mount Kenya Wildlife Conservancy
NBMC	National Bongo Management Committee
NEMA	National Environment Management Authority
NGOs	Non Governmental Organisations
NMK	National Museums of Kenya
RA	Rhino Ark
RSCF	Rare Species Conservatory Foundation
SSP	Species Survival Program
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNF	United Nations Foundation
WHWF	William Holden Wildlife Education Foundation
WHWT	William Holden Wildlife Trust
WRMA	Water Resource Management Authority
WSP	Woburn Safari Park

Executive Summary

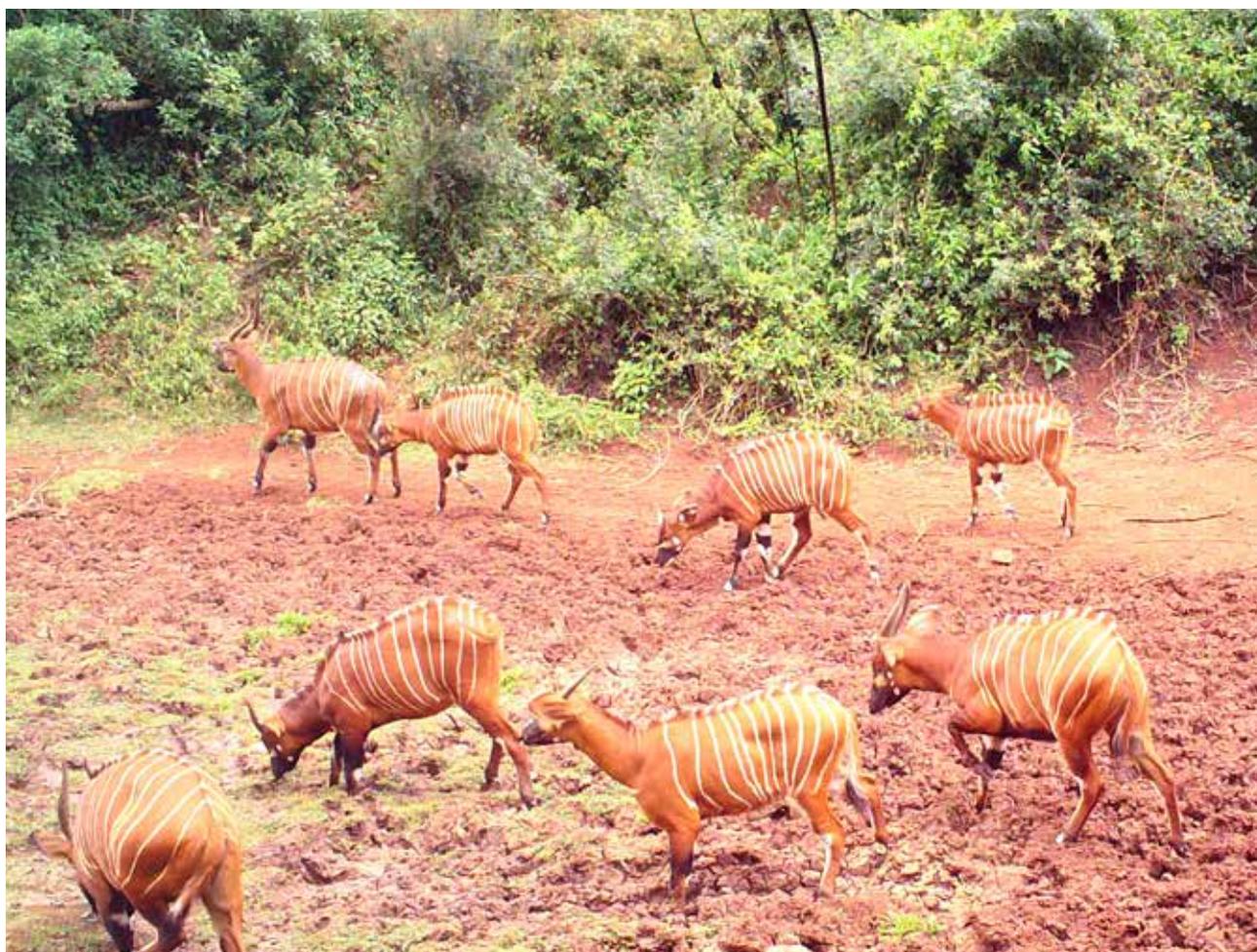
The Kenyan mountain bongo (*Tragelaphus eurycerus isaaci*) is an endangered tragelaphine antelope sub-species, endemic to the Aberdare, Mount Kenya, Cheranganis Hills and the Mau Forests Complex, with only a few individuals left in the Eburu, Maasai Mau and South Western Mau. The species has undergone a drastic decline in all these forests with limited information on the exact number of animals, though inferential figures stand at less than 100 individuals mainly confined to the Aberdare and Maasai Mau.

In 2003, bongo repatriation from the USA was initiated to establish a sustainable, in situ managed bongo population at the Mt. Kenya Game Ranch (MKGR) from which multiple wild-population recovery strategies could evolve. The principal objective of this project was to establish an in situ captive breeding program, in a natural setting, as the first phase of several conservation steps required to reintroduce mountain bongos to the wild. The project aimed to re-establish a viable and self-sustaining population in the bongo's native habitat. The repatriated bongos are currently in enclosures pending their proposed release into the wild. Other conservation measures have been undertaken alongside the repatriation to conserve and understand various biological aspects of the bongo in the wild. These have been through concerted efforts between the government, various stakeholders and conservation agencies.

The bongo species recovery strategy relies on the support and collaboration of the relevant government agencies, local communities and NGO's.

This National conservation and management strategy for the mountain bongo, developed through a consensus driven process, seeks to ensure that genetically viable populations of bongo persist in their natural habitat, within Kenya by:

- agreeing on appropriate conservation goals for Kenyan bongo populations;
- identifying the full breadth of issues that may impact on achieving these goals;
- identifying courses of action that will maximize the chance of success;
- engaging the knowledge, skills, and support of stakeholders in the action planning process;
- developing the criteria by which success will be evaluated.



Chapter 1

Introduction

The Kenyan mountain bongo (*Tragelaphus eurycerus isaaci*) is a critically endangered tragelaphine antelope sub-species, endemic to the Aberdare, Mount Kenya, Cheranganis Hills and the Mau Forests Complex, with only a few individuals left in the Eburu, Maasai Mau and South Western Mau. The species has undergone a drastic decline in all these forests with limited information on the exact number of animals, though inferential figures stand at less than 100 individuals mainly confined to the Aberdare and Maasai Mau (East, 1999; Reillo, 2002, unpublished report BSP 2016).

In Mount Kenya the species was believed to have been extirpated in the early 1990s, but BSP reported sightings and obtained camera trap images of mountain bongo near Chehe and Ragati forest blocks. The decline of the bongo antelope is attributed to various causes namely: habitat fragmentation, poaching, predation pressure, disease and other human factors (Stanley 1969, Ralls, 1978; Schiller et al., 1995; Kocket al., 1999).

Genetic effects on the population status have been assessed in a scientific paper by Henrik Svengred of Upsala University Sweden using genome nucleotide polymorphism (SNP's) data and is in the process of publication. Further, genetics work will need to be undertaken to inform future re-introductions and other bongo conservation and management interventions.

In 2003, bongo repatriation from the USA was initiated to establish a sustainable, in situ managed bongo population at the Mt. Kenya Game Ranch (MKGR) from which multiple wild-population recovery strategies could evolve. As outlined in the UNDP Project Document GLO/03/H05/A/1V/31, Repatriation of the Mountain Bongo Antelope to Mt. Kenya World Heritage Site, the principal objective of this project was to establish an in situ captive breeding program, in a natural setting, as the first phase of several conservation steps required to reintroduce mountain bongos to the wild. In late 2003, RSCF consolidated 14 female and 4 male bongos from U.S. AZA and private zoological facilities at the White Oak Conservation Center in Florida. An import permit was then issued by KWS to Mount Kenya Wildlife Conservancy - originally known as the Mount Kenya Game Ranch (MKGR) for export of the 18 individuals to Kenya on 30th January 2004. The rationale for the project stemmed from several key factors:

- the mountain bongo is a recognizable flagship species which can contribute to the conservation of East Africa's forest biodiversity
- the mountain bongo is considered a valuable natural resource by local people and tourists
- the large, healthy North American bongo population—derived entirely from Kenyan wild stock—is an important source for seeding a captive-breeding program in Kenya
- MKGR provides fundamental infrastructure to serve as a long-term breeding/management facility.

The project aimed to re-establish a viable and self-sustaining population in the bongo's native habitat. The repatriated bongos are currently in enclosures pending their proposed release into the wild. Other conservation measures have been undertaken alongside the repatriation to conserve and understand various biological aspects of the bongo in the wild. These have been through concerted efforts between the government, various stakeholders and conservation agencies.

The government, through KWS, recognises the need to conserve bongo habitat and various measures have been put in place: fencing of the Aberdare, Mt. Kenya and Eburu forests, strict reinforcement of anti-poaching as well as anti-logging laws, engaging armed and experienced rangers to man the forest as well supporting community based projects and education aimed at sensitizing people on the need to conserve the bongo (Butynski, 1999; Vanleeuwe et al., 2003).

For successful species recovery there is need to ascertain the real bongo refuge sites so as to direct conservation efforts to areas with bongo herds. The bongo species recovery strategy relies on the support and collaboration of the relevant government agencies, local communities, NGO's, such as the Bongo Surveillance Project (BSP), which is a group of experienced trackers and rangers. They have reported bongo in areas where they were thought to have been extirpated, such as in Eburu and Mt. Kenya. Current estimates of wild bongo populations are based on their reports which are based mainly on faecal counts, track sightings, and camera trap photographs.

Chapter 2

Status of Mountain Bongo (*Tragelaphus eurycerus isaaci*) in Kenya

The mountain bongo is listed as Critically Endangered by the IUCN/SSC Antelope Specialist Group (IUCN, 2003) and listed on Appendix III of the Convention on International Trade of Endangered Species of Flora and Fauna (CITES), which allows limited trade on the species. In Kenya, bongos are accorded full protection under the Wildlife Conservation and Management Act, 2013.

Mountain Bongo - scientific classification

According to Huffman (2004) mountain bongo is taxonomically classified as follows:

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Artiodactyla

Family: Bovidae

Subfamily: Bovinae

Genus: *Tragelaphus*

Species: *Tragelaphus eurycerus*

Subspecies: *T. eurycerus isaaci*

The bongo, *Tragelaphus eurycerus*, is the largest and heaviest African forest-dwelling antelope weighing up to 300kg. Its colour is bright chestnut red, becoming darker with age, and it has 12-14 transverse narrow white stripes on the shoulders, flanks and hindquarters. Both sexes have massive spiral horns with light yellowish tips, (Dorst and Dandelot, 1995). It is highly prized by game hunters and wildlife lovers alike for its rarity and stunningly handsome coat.

Two subspecies, lowland rain forest and eastern montane race, are known to exist. The range of the lowland rain forest subspecies, *Tragelaphus eurycerus eurycerus*, is discontinuous from the lowland rain forest of West Africa and Congo basin to the Southern Sudan. The eastern montane race, *Tragelaphus eurycerus isaaci*, on the other hand, has isolated populations existing in the montane forests of East Africa, namely Mount Kenya, the Aberdare and Mau forests. Populations in Cherangani Hills and Chepalungu forest became extinct 27 years ago (Klaus-Hulgi *et al.*, 2000).

Previously there was scanty information on the ecology of the bongo due to the highly elusive nature of the species, which is armed with an acute sense of hearing and dwells in densely forested habitats coupled with rugged terrain, thereby making its behaviour difficult to observe. Most information came from former hunters (Kingdon, 1982) and a single captive breeding program at Mount Kenya Wildlife Conservancy. However, recent comprehensive studies (Estes *et al.*, 2010, 2008 & *in press*) conducted in the Aberdare, Mt. Kenya, Eburu and all Mau forests have generated a wealth of information on bongo ecology.

Feeding ecology of the bongo

Previously bongo was thought as entirely a browser. Hoffman and Stewart (1972) in Hillman & Gwynne (1987) described bongo as a 'tree and shrub foliage eater' and as 'selectors of juicy, concentrated foliage'. However recent studies found that in forest-bush land ecotones and forest glades, grass can make up a large proportion of bongo food intake (Klaus-Hugi *et al.*, 1999). Below is a summary of mountain bongo foliage across different habitats:-

Table 1. Mountain Bongo food plant species in different ranges

Area	Food material	Source
Forests of Kikuyu and Mau escarpments, Kenya.	"Nettles", <i>Arundinalia alpina</i> (bamboo leaves), bark of tree roots and saplings roots dug using its horns.	Stigand, 1909
Forests of Kikuyu and Mau escarpments, Kenya.	Charred wood, dead bark, burnt wood, <i>Mimulopsis</i> sp.,	Stevenson-Hamilton, 1912, Percival 1927
Mau forest, Kenya	Bamboo, horns used to bring down higher vegetation.	Ionides, 1946
Mt. Kenya	<i>Parothesis communis</i> , <i>Senecio biefrae</i>	Edmond-Blanc, 1960
Mau, Aberdare	<i>Mimulopsis solmsii</i> which is characterised by periodic toxicity	Simon, 1962
Cherangani Hills	Bark of wild croton (<i>Macrostachyus</i>), dead wood	Tisti, 1964
Aberdare	<i>Impatiens</i> sp, various creepers, not much bamboo	Roots pers com in Kingdon, 1982
Treetop, Aberdare and Ragati, Mt. Kenya	HERBS: <i>Hypoestis verticillaris</i> , <i>Justicia striata</i> , <i>Crassocephalum montuosum</i> , <i>Parothesis communis</i> . CREEPERS: <i>Senecio pelitianus</i> , <i>S. nandensis</i> , <i>Basella alba</i> , <i>Phytolacca dodecandra</i> . SHRUB: <i>Erythrococca bongensis</i> .	J. Sutton pers.comm
Upper Congo, Zaire	Does not graze, eats leaves and otherherbage.	Christy, 1924
South West Sudan	Bark of <i>Ficus natalensis</i> , leaves of saplings such as <i>Ceiba</i> Sp.	Brocklehurst, 1931
Gold coast, Ghana	Visits old farm feeding on sweet potatoes vines, cassava and cocoyam	Canadale, 1947
Belgian congo, Zaire	Shrub and tree shoots, buds, leaves, herbs beneath trees, stinging nettles; young tree roots obtained by digging with horns.	Van Den Bergh, 1961
Ivory coast west Africa	<i>Musanga</i> sp., <i>Ceiba</i> sp., and grass <i>Paspalum conjugatum</i>	Rall, 1978

Source: Hillman and Gwynne, 1987.

Historical Distribution

The bongo's range extended across the rainforests of Central Africa, from Sierra Leone, Liberia, Ivory Coast, Cameroon, Central African Republic, Congo, Sudan, Kenya, Uganda, Tanzania and Ethiopia, Fig 1 (Hillman, 1982).

In Kenya, there are isolated pockets hosting various meta-population, they include:

- The Aberdare ecosystem comprising the National Park and the forest reserves enclosing 2000 km² within the completed fence. According to Lam (1997), bongo range within the Aberdare included the northern salient and bamboo zone.
- Mt. Kenya where the Eastern side forests were the historically known areas and that is currently being fenced to incorporate over 2,700 km² of National Park, National Reserve and forest reserves
- Mau south west forest reserve and Mau Eburu Forest Reserve 87 km²
- Mt. Londiani, Chemorogok/Lembus adjacent forests and Cherangani hills – (little information is available on the current population status).

In the last few decades there has been a rapid decline in numbers within the continent due to poaching and human pressure on habitat (Ralls, 1978 and Estes, 1991). In Kenya, the population of bongo has been on a downward trend and indeed in some of the ranges local extinction has been reported. These include the Cherangani and Chepalungu hills.





Figure 1. Historical bongo ranges in Africa (the checked area denotes bongo range).

Current Distribution and Status

The Aberdare National Park was previously a mountain bongo stronghold, evidenced by the enormous number of individuals known to have been captured from the area (Ronald 1964). Around 1975 the bongo population there numbered more than 500 individuals; however, the population has been on a downward trend (Kingdon, 1982) and was estimated at about 50-75 individuals in 2010, mainly in the northern sector (around Kanjwiri Hill) and the salient sector (around sub-headquarters) with a scattered few of 2-4 animals per group dispersed across the eastern side, south to the Maragua River area.

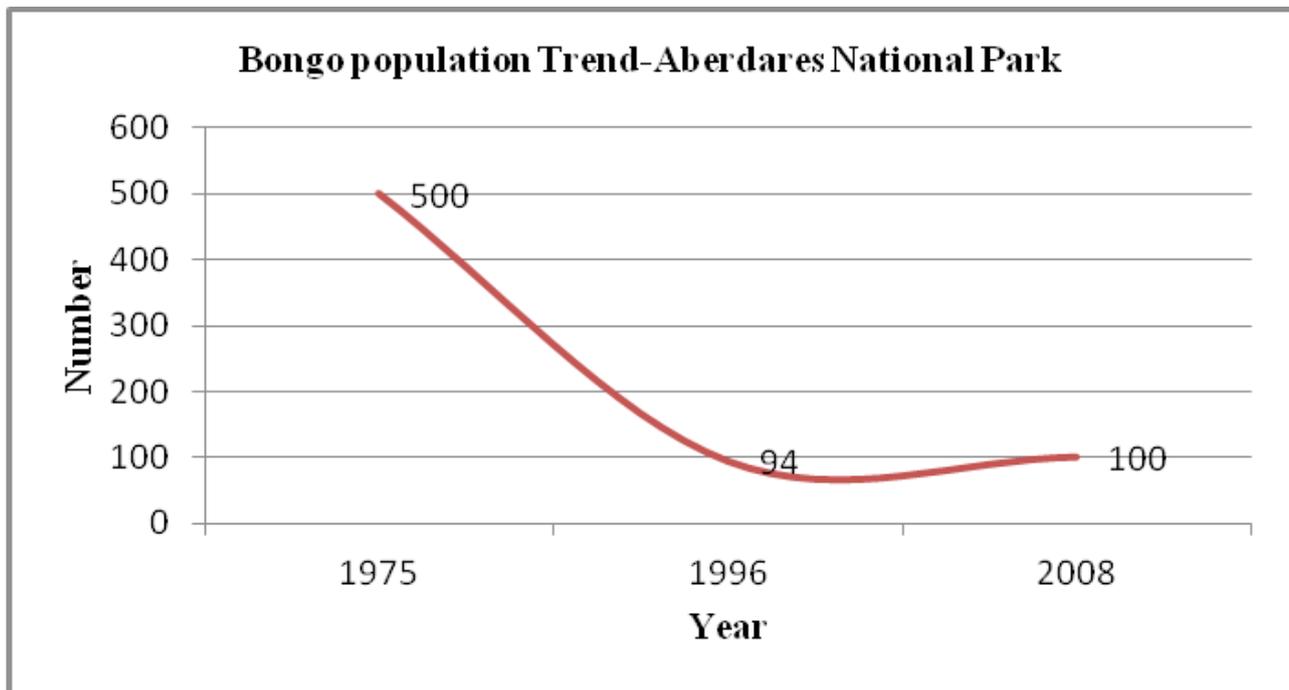


Figure 2. Trend in bongo population in the Aberdare National Park

Current bongo ranges in Kenya

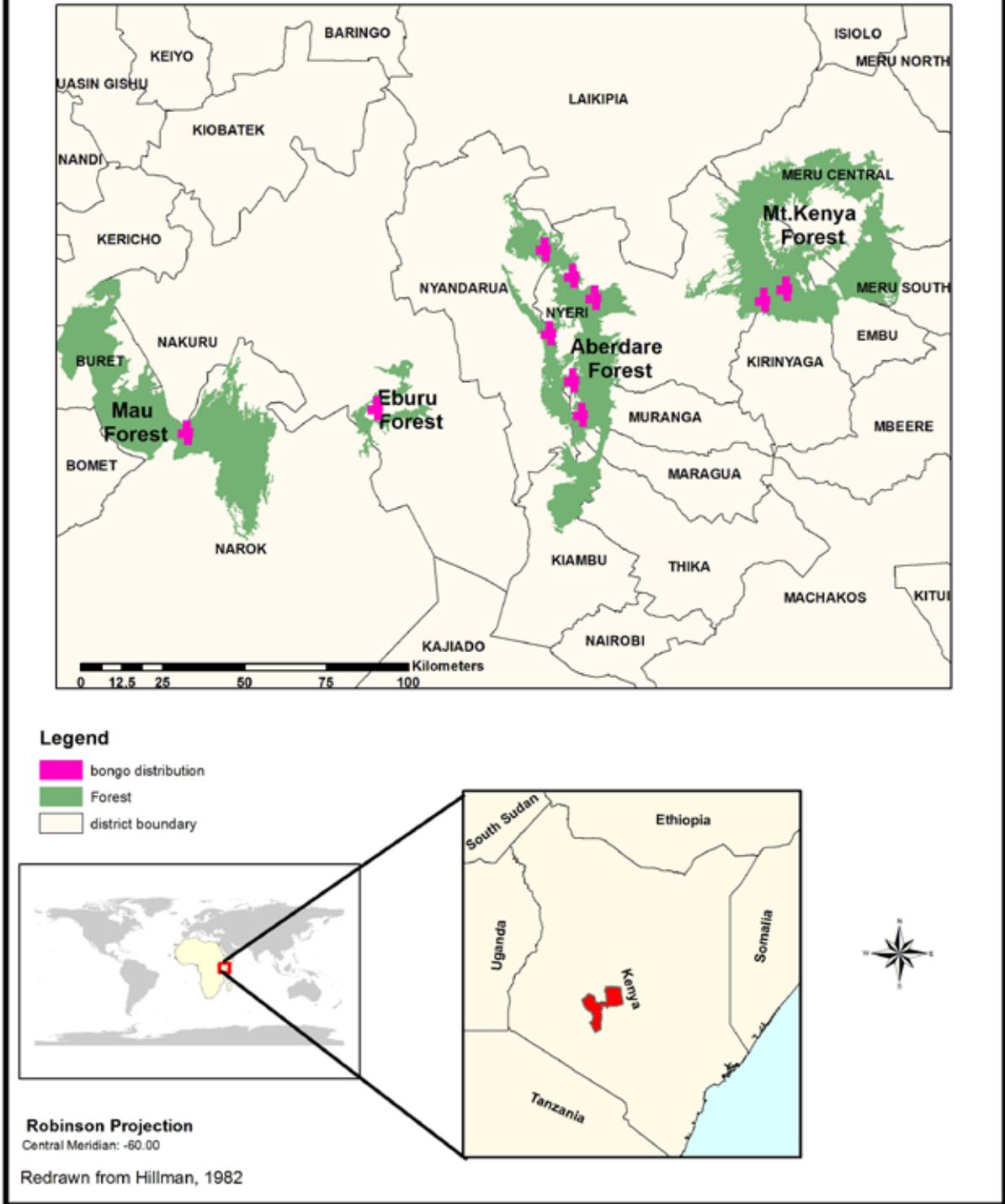


Figure 3. Current bongo ranges in Kenya (from right; Mt. Kenya, Aberdare, Eburu and Mau Forests)

Population estimates of bongo in Kenya in the wild ranges are as follows:

Table 2. National Mountain Bongo population estimates

Area	Population estimate	CameraTrap
The Aberdare National Park and Reserve (BSP estimate is based on mainly Honi population, no presence registered for 2+ years N. Aberdare - Kanjwiri and 5+ years S. Aberdare)	40- 50	Up to <u>39</u> potential. 15+ calves observed. However, take into consideration concerns for Kanjwiri group (4) not seen in 2 years. S. Aberdare BSP accessibility issues. (Helicopter utilised in 2008 surveillance)
Mt. Kenya National Park and Reserve (Ragati) – based on trap photographs and visual forest information collected	6	3-4 Issue is no male photographed. Track only. Min breeding potential. Zero calves.
Eburu – based on trap photographs and visual forest information collected	6	6 Min breeding. No females seen recent years. Zero calves.
SW Mau Forest Reserve. Based on trap photographs and visual forest information collected. See new surveillance below.	6- 9	4-6 Group small. Evidence slightly more positive, as calf and breeding mix. Security issues.
*Mt. Londiani	Nil	
*Tinderet Forest - Mau	Nil	
*Koibeket Forest – Mau	Nil	
*Kedowa Forest – Mau	Nil	
*Lembus Forest – Mau	Nil	
*Mau Summit – Mau	Nil	
Maasai Mau. Based on Trap photographs and visual forest information collected.	25	Up to 18 on camera trap
Cherangani	Nil	
	96	73

Source: BSP 2016

Chapter 3

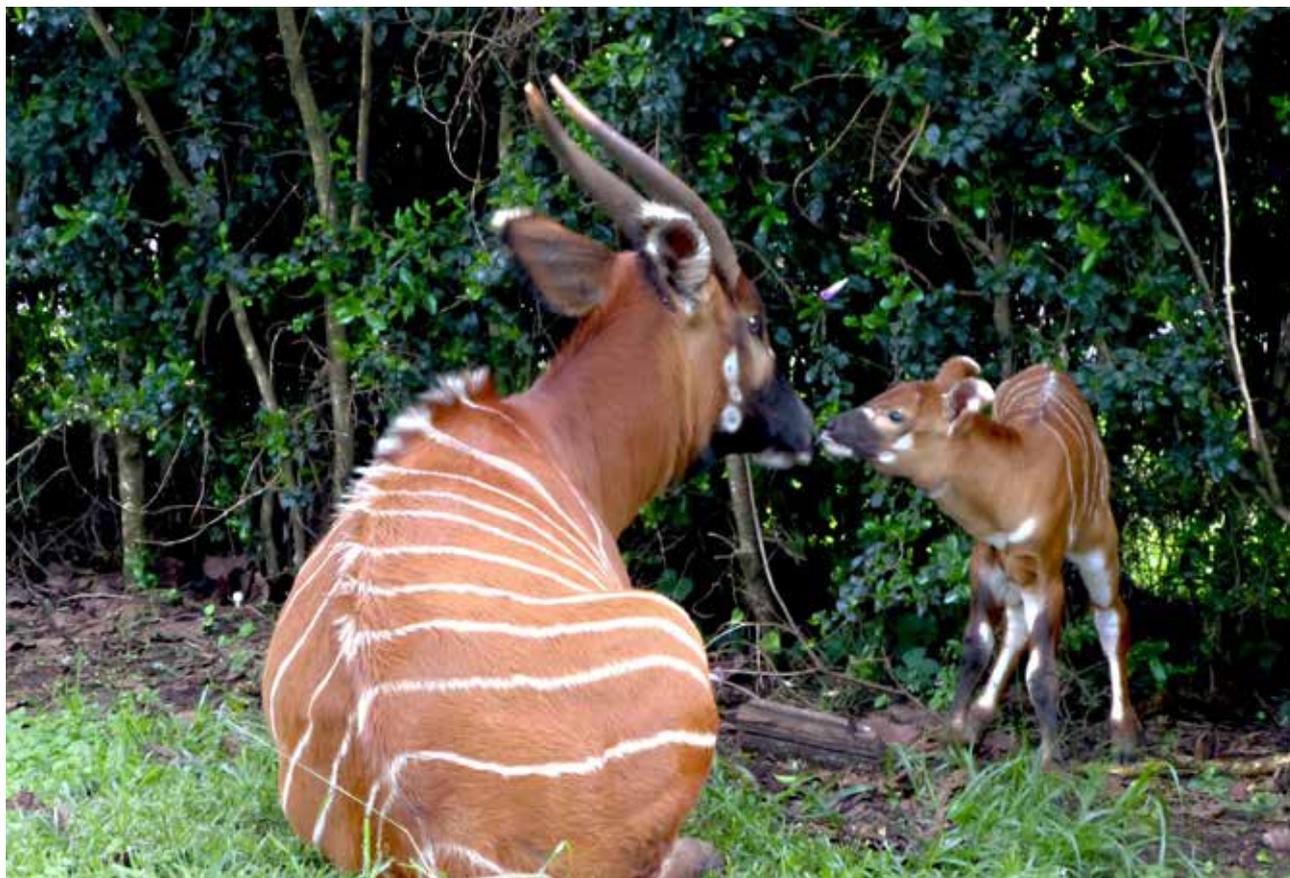
Threats to Conservation of Mountain Bongo in Kenya

Introduction

Trapping of bongo in the early 1900s may have contributed to the mountain bongo decline. Within bongo ranges a series of pits were dug and a fence made of bamboo poles set up in between the pits to funnel animals in. The pits were concealed with bamboo leaves loosely held by feeble sticks and any animal stepping onto them would land in the pit. These pitfall systems were used for live capture, especially for zoo destined animals. To date the pits still lay agape in bamboo zone around the park sub headquarters and the southern Aberdare. At Karuiria and Kiandongoro areas, salt was used as bait at major salt licks where bongos were shot.

In the Aberdare, mountain bongo sightings along motorized tracks in the park and at the two game viewing lodges (Treetops and Ark) have declined drastically since the 1970s. An observed contraction of the bongo's range is perhaps one of the reasons for the decline. At first, the frequency of bongo visits to the Treetops and Ark Lodge waterhole decreased. The density of trees around Treetops Lodge decreased by 98% between 1947 and 1993 (Waithaka, 1993). This has resulted in a huge change in vegetation structure. This may have made bongos move higher up to the primary or to less disturbed vegetation of the higher salient and even into undisturbed bamboo zone.

Increased predation by introduced lions may have had a negative impact on bongo numbers and range (Musyoki, 1995). An observed increase in the number of lions in the salient coincided with a decline in the number of bongo.



Proximate and ultimate threats

THREAT	TARGET	CAUSE	SOURCE
Hunting	All populations	Dog-assisted hunting by local people for subsistence purposes. Sport-hunting and professional hunting: though to a lesser extent sport hunting may have contributed to population decline. Trapping of bongo in the early 1900s destined for the zoos	Estes, 1991, Lam, 1997.
Habitat degradation and loss	Habitat loss has resulted in a large reduction of populations in the bongo historic range.	Encroachment of bongo ranges. Heavy, sustained grazing by relatively high densities of domestic livestock resulting in changes to the vegetation communities and erosion	Estes, 1991 Waithaka, 1995.
Diseases	Those populations in areas where there is a diffuse wildlife/livestock interface.	Rinderpest: The disease is believed to be responsible for the decline of bongo population in Mau Theileria: Out of 18 bongos repatriated from USA, 5 died of the disease.	Estes, 1991. Davies 1992 http://www.animalorphanagekenya.org Hunt per comm
Plant toxicity: Poisoning by 'Setyot' vines <i>Mimulopsis solsmii</i>	All populations	Periodic toxicity of <i>Mimulopsis solsmii</i> that is reported to be lethal in the 1 st –2 nd year of the plant cycle. Though this is contentious*.	Davis, 1993.
Predation	Breeding populations	Increase in hyaena and/or leopard population. Breeding populations particularly the ones that co-exist with leopards, and hyaenas. Neonates are highly vulnerable to predation as females nearing parturition move to secluded areas away from the herd thereby making a trade off in group anti-predatory measures.	Sillero-Zubiri, 1987.

Source: Hillman and Gwynne, 1987.

Chapter 4

Recovery and Action Plan for the Mountain Bongo in Kenya

KWS has over the years geared efforts to the conservation of the mountain bongo. This has been through collaboration with relevant government agencies such as KFS, conservation partners i.e. MKWC, BSP, Rhino Ark, researchers, communities and other collaborating institutions.

Wildlife in Kenya is a national resource and thus property of the state. The Wildlife Conservation and Management Act, 2013 describes wildlife as *'any wild and indigenous animal, plant or microorganism or parts thereof within its constituent habitat or ecosystem on land or in water, as well as species that have been introduced into or established in Kenya'*. The mountain Bongo is listed under the sixth schedule of the Act as an endangered species and prescribes special focus on this species through development of a recovery plan. KWS has the legal mandate to conserve and manage wildlife in the country, hence the need to take the initiative to develop and implement the mountain bongo national strategy. In pursuit of this, a bongo taskforce was formed in the year 2008 that included species specialists and stakeholders to promote conservation efforts by formulating a National Bongo Conservation Strategy.

Background

On 26-28 July, 2010, 59 participants from 20 organisations gathered at the Green Hills Hotel in Nyeri, to develop a National conservation and management strategy for the mountain bongo (*Tragelaphus eurycerus isaaci*). The workshop was facilitated by the IUCN/SSC Conservation Breeding Specialist Group (CBSG) with principal sponsors being Kenya Wildlife Service (KWS) and Woburn Safari Park (UK). The resulting draft action plan was subjected to further review by the Bongo Task Force, a team of technical personnel and stakeholders convened by KWS for the purpose of taking forward the bongo conservation agenda in Kenya.

The workshop agreed on the following goal:

Develop a strategy to ensure genetically viable populations of bongo persist in their natural habitat, within Kenya by:

- Agreeing on appropriate conservation goals for Kenyan bongo populations;
- Identifying the full breadth of issues that may impact on achieving these goals;
- Identifying courses of action that will maximize the chance of success;
- Engaging the knowledge, skills, and support of stakeholders in the action planning process;
- Developing the criteria by which success will be evaluated.

Participants contributed ideas and themes towards a long-term, shared vision for mountain bongo conservation in Kenya. Participants identified what they considered to be the full breadth of issues threatening bongo in the wild and these issues were grouped into four broad categories: Poaching, Habitat, Small Population issues and Disease. Sub-sets of the issues were further developed within working groups to produce a series of pertinent "threat statements". Using these threat statements, each group worked methodically to develop mitigating Strategic Objectives, Targets and Activities. Strategic Objectives were brought to plenary and prioritised by all participants in terms of both their urgency and importance in the recovery of mountain bongo. Activities were developed to be S.M.A.R.T (Specific, Measurable, Achievable, Relevant and Time-bound), and to be both necessary and sufficient for achieving the Strategic Objectives identified. Two additional working groups were formed, one to progress site-specific population size targets for mountain bongo and the other to build consensus on a proposed captive release project. The time-lines and "measurables" attached to each activity provide the means to evaluate successful completion of actions, and the site-specific population targets provide a means of evaluating the success or otherwise of those actions in furthering the recovery of mountain bongo in the wild.

In the following sections, each Strategic Objective, and its associated threat issues, are described using text and statements recorded at the workshop, with some additional clarification provided during the editing process.

VISION

The **50-100** year vision for mountain bongo in Kenya:

We envisage viable, free-ranging and genetically representative populations of mountain bongo, thriving across intact historic mountain ecosystem ranges, cherished by the Kenyan people and the global community.

GOAL

To secure minimum population sizes for mountain bongo within their ranges in Kenya, to achieve a national population of 750 individuals over the next 50 years.

Region	Working Targets for Population Size	Region	Working Targets for Population Size (to be updated during strategy implementation)
Aberdare	300	Londiani	20
Mt. Kenya	250	Chepalungu	20
Mau	100	Cherangani	20
Eburu	20	Mt. Elgon	20
		Population Estimates	750

In setting these minimum population targets, contributors to the strategy:

Recognised

limited information on historic levels of bongo in Kenya and their interconnectedness the remaining uncertainty around current bongo numbers and location, particularly in west Mau and Eburu; limited information in Londiani the difficulty of measuring current and potential carrying capacity

Accepted

the predicted rate of population growth in Kenya (1 million people a year) the need for improved community livelihood the impossibility of wide-scale human displacement from some areas and understood that the targets agreed are working targets that the targets are below recommended thresholds for long-term demographic and genetic viability that short-term viability of some if not all sub-populations, may rely on management of Kenyan stocks as an interconnected meta-population that incorporation of in-country and international captive populations into the meta-population could add to overall viability that not only the numbers of animals but their genetic qualities, must be taken into account with regard to management.

These minimum population sizes may be reviewed as these circumstances change. Details of the information and thinking that led to these targets are provided in the next section.

Securing a sufficient number of animals in the wild is a key component of species recovery. However, determining what constitutes a "sufficient number" is a complex issue. Further, for a skittish, forest mammal like the mountain bongo, monitoring numbers accurately to determine whether targets have been reached presents an even greater challenge. Numerical targets can play an important role in sustaining momentum and evaluating progress within a recovery programme. The physical, biological and ecological attributes are key considerations, in population restoration.

The following rules of thumb, taken from literature, were compiled to assist discussions of what might constitute achievable population size targets for bongo over the next 50 years a) for Kenya as a whole and b) in each bongo sub-population.

N=100s – Short-term Demographic Viability (e.g. Schaffer, 1987)

All populations are subject to random variation in birth and death rate, and in sex-ratio. The smaller a population becomes, the greater the impact of these random processes on population growth and stability. In very small populations (e.g. 10s – 100s) the effect can be sufficient, on its own, to cause extinction.

N=500 – Short-term Genetic Viability (Franklin, 1980)

In small, closed populations inbreeding is likely to occur and with it, inbreeding depression. This generally manifests as a reduction in survival and/or reproductive rates and an increase in expression of rare genetic disorders. Inbreeding depression can be more severe where inbreeding accumulates quickly. A rule of thumb advocated by domestic breeders and adopted by conservation geneticists is to keep the rate of inbreeding below 1% per generation. This requires a genetically effective size (N_e) of 50 individuals. The

genetically effective population size refers to the size of an “idealised” population that loses gene diversity through drift (or chance) at the same rate as the study population. Wild populations differ significantly from the characteristics of an idealised population and are thought to have an effective size of around 10% of the census size. Keeping the rate of inbreeding down below the 1% threshold then, is likely to require around 500 individuals.

N=5000 – Long-term Genetic Viability (Franklin, 1980)

Long-term genetic viability refers to a population’s evolutionary potential. That is, the potential for adapting to future environmental change. Genetic variation provides this potential. Small populations lose gene diversity quickly through drift (chance). In closed populations, gene diversity can be gained only through new mutations, which are relatively rare events. As a population grows, the rate at which gene diversity is lost through drift draws closer to the rate at which it is gained through mutation. Though debate continues, scientists generally converge on an effective size of 500 for this mutation-drift balance. Assuming as we did above, an effective to actual size ratio of 10%, a total wild population size of around 5000 individuals should ensure that genetic diversity, and therefore adaptive potential, is not in decline.

N=1377 – 5800 – Long-term Demographic Viability (Brook et al 2006; Traill et al 2007; Reed et al 2003).

Long-term demographic viability requires that a population can withstand both year-to-year environmental variation and also extreme environmental events (catastrophes) such as disease outbreaks and climate shifts. The numbers needed will depend on the scale and frequency of these environmental changes as well as the biology of the taxon.

N > 5800 – Ecological Functionality, Sustained Harvest etc. (Sanderson, 2006)

Other considerations may factor in setting target population sizes, such as the taxon’s function in the ecosystem. Maintaining this function across a taxon’s range (or former range) may require larger population sizes and densities than those required for population viability alone.

There are several potential approaches to assessing where bongo should sit within this range, and a number of pieces of additional information which could usefully inform decisions. These include:

Historical population levels in Kenya: returning numbers to a size that pre-dates current human-induced threats often presents a useful starting point for discussion. However there is scant information on previous numbers other than a 1975 estimate by Kingdon of 500 animals in the Aberdare. In addition, some sites such as Eburu have undergone extensive ecosystem changes in recent decades rendering historic levels impossible to achieve.

Potential carrying capacity: of existing occupied sites and of those from which bongo have become recently extinct could provide a more realistic estimate of what may be possible in the short to medium-term. Bongo Surveillance Project estimates of potential carrying capacity were as follows: Aberdare-600, Eburu-40, Mau-300, Mount Kenya-600. Additional recently vacated sites are considered to include: Cherangani (degraded), Londiani, Chepalungu, and Mount Elgon (disputed). No estimates of carrying capacity are available for these.

Theoretically possible growth rates: population models (Veasey, unpublished) suggest that if threats are removed and populations allowed to resume growth rates within the range observed in captive populations (7% per annum), bongo numbers could reach 3000 in 50 years. These calculations suggest that protection and habitat availability rather than bongo biology will be the constraining factors in recovery.

Requirements for further information: to aid the development of numerical targets, more information is required regarding: the amount of suitable habitat across the former range of mountain bongos how much suitable habitat is required to support an individual bongo how observations by Lyndon Estes and others - that human disturbance can exclude bongo from otherwise suitable habitat – should be factored into carrying capacity assessments current wild census numbers for bongo across current and potential sites – to date resources have been insufficient to carry out exhaustive, systematic surveys of current and potential sites. Assuming target population sizes are reached, different management approaches could have different consequences for population viability. Three scenarios are considered.

Scenario 1: proposed targets for Kenya are reached and populations continue to be managed as isolated units.

This would leave populations at Eburu, Londiani, Chepalungu, Cherangani and Mount Elgon at around 20 animals each and therefore vulnerable to short-term demographic stochasticity and inbreeding depression. Populations at Mau, Mount Kenya and the Aberdare would be expected to have some resilience to demographic stochasticity but would remain vulnerable to inbreeding depression.

Scenario 2: proposed targets for Kenya are reached and populations are managed as a meta-population through strategic exchanges between populations.

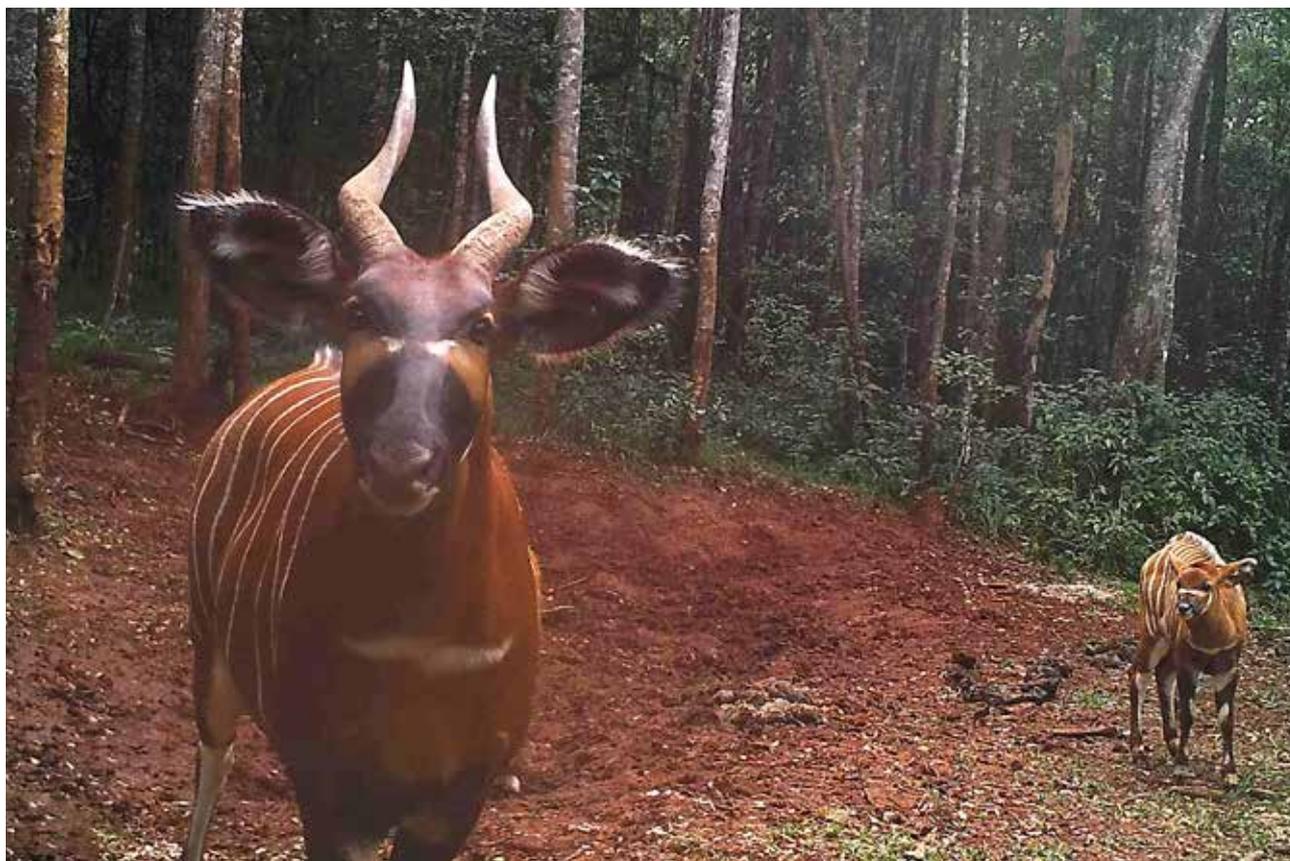
If practically achievable this scenario would see the sub-populations drawn together demographically and genetically to form, in functional terms, a single unit of 730 individuals. A population of this size would be expected to show resilience to short-term demographic and genetic effects.

Scenario 3: proposed targets for Kenya are reached and the meta-population includes in-country and international captive populations.

With approximately 500 individuals in captive populations this would bring the meta-population total to around 1230 individuals, which starts to approach the lower end of the range for long-term demographic security. The inclusion of captive populations can confer some advantages in the area of genetic retention. Well-managed captive populations can retain genetic diversity more efficiently than wild ones of the same size because of the ability in captivity to manage pairings more intensively. At typical levels of genetic performance (Wild $N_e/N = 0.1$; Captive $N_e/N=0.3$) scenario 3 could result in an effective population size of approximately 223, which is more than required to keep inbreeding below detrimental levels and approaches half of the effective population size required for long-term genetic security.

Computer-based population modelling tools can be useful in examining population viability and optimal management scenarios in more detail.

Of these, scenario 3 is recommended, and recommended actions for moving towards this, including the inclusive management of global mountain bongo stocks as a meta-population and the integration of the European and North American managed programmes (EEP and SSP) into the national implementation framework for bongo conservation, are provided elsewhere in this document (see Sm--all Population Issues and Implementation Framework).



Mountain Bongo National Action Plan

VISION and GOAL

Vision

We envisage viable, free-ranging and genetically representative populations of mountain bongo, thriving across intact historic mountain ecosystem ranges, cherished by the Kenyan people and the global community.

Goal

To secure minimum population size for mountain bongo within their ranges in Kenya, to achieve a national population of 730 individuals over the next 50 years

Strategic Objectives

Consideration of threats facing mountain bongo recovery in Kenya led to the development of a number of strategic objectives, which were prioritised by workshop participants in order of overall importance to bongo conservation and urgency. The three highest ranked strategic objectives are:

Security: to secure, immediately, remaining wild populations from further poaching and disturbance by providing, for each, an Intensive Protection Zone, staffed by a permanent security force engaged in daily patrols, anti-poaching and de-snaring activities, and law enforcement.

Human Activities: to manage legal activities to ensure sustainability, and to stop illegal human activities that destroy mountain bongo habitat.

Policy Harmonisation: to ensure that all policy issues that threaten the conservation of mountain bongos and their habitats are harmonised, key to this being the establishment of a central coordinating body.

The full list of strategic objectives was organised into general themes to minimise duplication and encourage synergies. Prioritisation scores were amalgamated during this process to produce a final, ranked list (see Table 3.). The original list, with prioritisation scores, is provided in Appendix 1.

Table 3. Consolidation of strategic objectives into eight topics, ranked by amalgamated urgency and importance scores

Strategic Objectives: Consolidated and Ranked	
1	Security - to secure wild populations Includes: Security, Information Feedback Mechanisms (Total = 75)
2	Human Activities - to manage legal activities, stop illegal human activities that destroy mountain bongo habitat to ensure sustainability. (Total = 48)
3	Small Populations: to use novel technologies to address the vulnerability of small and isolated bongo populations Includes: Captive Breeding, Resources and Research, Genetic, Demographic Mgmt. (Total = 46)
4	Communities: optimise the participation of communities living adjacent to bongo habitat in bongo conservation Includes: Community Awareness, Community Issues, Prevailing Poverty Levels, Limited Alternative Livelihoods (Total = 40)
5	Policy Harmonization: to ensure policies enhance conservation efforts for mountain bongos and their habitats. Includes: Policy Harmonisation, Greater Inter-agency Cooperation (Total = 29)
6	Law Enforcement And Prosecution: to enhance law enforcement and prosecution through engagement of relevant security agencies, office of the director of public prosecutions and the judiciary. Includes: Lenient Penalties, Corruption (Total = 7)
7	Species Interaction: to minimise the negative impacts of other species, on bongo (Total = 1)
8	Disease: to optimise the assessment and management of disease risk to wild bongos (Total = 0)

Strategic Objective 1

Security: To Secure Wild Bongo Populations.

Urgency ranking = 1

Importance ranking = 1

Enhancing security was considered by stakeholders to be both the most urgent, and the most important, of all current bongo conservation issues. Poaching for bush meat in bongo-inhabited areas poses an imminent threat to wild populations thus need for targeted security. There are limited resources for bongo surveillance and monitoring thus the need for concerted efforts between various stakeholders. Communities living adjacent to forests are a vital source of intelligence on illegal activities. There is need to improve on response time by authorities and enhance access to hot-line numbers.

Target 1.1				
<ul style="list-style-type: none"> Increased number of well-equipped security teams. An Intensive Protection Zone (IPZ) established at each remaining bongo site. 				
Activities	Responsibility	Time-line	Indicators	
1.1.1	<ul style="list-style-type: none"> Establish an Intensive Protection Zone (IPZ) at each bongo range, to be staffed by a permanent security team of trained rangers. Enhance security operations of KWS/KFS within the bongo ranges in collaboration with partners. Enhance the coverage of BSP and existing community scouts in the Aberdare, Mt Kenya, and Eburu, and extend to west Mau and Londiani. 	KWS, KFS, BSP, Community scouts, MWKT, Rhino Ark	IPZ in place within 6 months. Teams operational in 6-12 months	IPZ established, KFS and KWS security patrols increased, security reports, BSP monitoring reports
1.1.2	<ul style="list-style-type: none"> Capacity building for KWS, KFS rangers and train community scouts on bongo surveillance and monitoring skills. 	KWS, KFS, BSP, Community scouts, MWKT	As needed	Training report, number of staff trained

Target 1.2				
<ul style="list-style-type: none"> Information sharing improved between stakeholders. Increased awareness of KFS/KWS hotline numbers and new contacts and networks (toll-free numbers) set up where needed. Communities use hotline numbers to report illegal activity. 				
Activities	Responsibility	Time-line	Indicators	
1.2.1	<ul style="list-style-type: none"> Establish mechanisms / platforms through which stakeholders can share information 	KFS, KWS	6 months	Number of platforms established Number of meetings held

1.2.2	<ul style="list-style-type: none"> Provide hotline numbers to communities and stakeholders through existing outreach programmes. 	KWS - senior warden of each national park, KFS, BSP, WHWF, MKT, Rhino Ark	6 months	Number of outreach programmes held,
1.2.3	<ul style="list-style-type: none"> Provide KWS, KFS and KACC toll-free numbers to be used in reporting illegal activities. Provide tie-ins with providers for collaboration, in the form of advertising /publicity. 			Toll free number/ hotline availed to community members
1.2.4	<ul style="list-style-type: none"> Establish a reward system for reports leading to arrest and/or successful prosecution. 			Number of arrests done in collaboration with community



Strategic Objective 2

Human Activities: To Manage Legal Activities, Stop Illegal Human Activities that Destroy Mountain Bongo Habitat to Ensure Sustainability.

Urgency ranking = 4

Importance ranking = 2

[“Human activities” in this context are activities which impact on the species and their habitats].

Human activities – both illegal and legal create challenges in bongo conservation. Activities include livestock incursions, infrastructural developments and energy exploration, forest fires, forest resource extraction (e.g. water and timber) and poaching for bush meat. Security needs to be enhanced in all bongo ranges and forest rehabilitation programs put in place.

Demands for forest resources are expected to increase as the human population expands. Kenya has increasing energy requirements thus there is need to balance development with conservation. Tourism infrastructure within national parks is expected to increase to broaden the income base of KWS and KFS. It is important to ensure that the required Socio-economic and Environmental Impact Assessments (SEIAs) attach sufficient importance to the protection of critical bongo habitat.

Action to protect habitat against human activities needs to be well-targeted through zonation and demarcation of critical bongo habitat. Comprehensive mapping of existing and former bongo habitats is necessary, alongside mapping of the locations earmarked for development projects.

Target 2.1				
<ul style="list-style-type: none"> • Legal activities that negatively impact bongo habitat are appropriately controlled. • Illegal activities that that negatively impact bongo habitat, are stopped. 				
Activities		Responsibility	Time-line	Indicators
2.1.1	Minimise illegal activities in bongo ecosystems.	KWS, KFS	On-going	Establish baseline then; % reduction of illegal activities
2.1.2	Control/regulate consumptive utilisation of bongo habitats (e.g. grazing, cultivation) as per site-specific plans.	KFS	On-going	%reduction of use of ‘bongo hotspots’
2.1.3	Zone and demarcate controlled utilization areas.	KFS	On-going	Updated map on utilisation zones
2.1.4	Review existing ecosystem management plans to incorporate protection for critical bongo habitats.	KWS, KFS	3 years	Reviewed ecosystem plan
2.1.5	Establish guidelines for undertaking comprehensive mapping of current and potential bongo habitats.	NBMC	6 months	Guidelines established
2.1.6	Undertake comprehensive mapping of current and potential bongo habitat.	NBMC	2 years	Bongo habitat map
2.1.7	Continuously monitor and survey bongo and their habitats.	BSP	Ongoing	Survey reports

Strategic Objective 3

Small Populations: To Use Novel Technologies to Address The Vulnerability of Small and Isolated Bongo Populations.

Urgency ranking = 3

Importance ranking = 3

Small and isolated populations have an increased risk of decline and extinction due to demographic events (fluctuations in sex ratio, birth and death rates, environmental variation and random catastrophic events) and genetic influences (inbreeding depression, reduced genetic diversity and consequent reduced ability to adapt to change at the population level). The remaining wild bongo populations are isolated and fall below levels required for long term survival.

Captive management programmes within and outside Kenya offer a potentially valuable source of animals for supplementing wild populations. However, this will require careful management. Failure to manage captive bred populations appropriately from a genetic and demographic perspective, and to select appropriate target animals and recipient populations for reintroduction, translocation or supplementation, could harm aspirations to conserve gene diversity and population viability in wild populations, in the longer-term.

The degree of genetic differentiation in wild populations is unknown. Genetic profiling is required, of all bongo populations, both wild and captive, to clarify relatedness, diversity, priority and disease susceptibility.

Methodologies for estimating populations of forest mammals and carrying capacity are complex and intensive due to the challenging nature of the environment. Current bongo population estimates are based on BSP data obtained from a combination of methods such as use trackers, camera trap observations and DNA analyses of faecal samples. There is need for more resources to undertake extensive and systematic studies through validated methodologies to improve the accuracy of these estimates.

Targets 3.1				
<ul style="list-style-type: none"> • Small population-related conservation and research needs over the next five years are identified • Budgets developed and funding sources identified within eight months. • Funds are secured to implement the conservation/research action plan within two years 				
Activities		Responsibility	Time-line	Indicators
3.1.1	Identify research needed (see also under genetic and demographic requirements) over the next five years to support conservation of bongo in the wild.	KWS - Senior Research Scientists in bongo ranges, KFS biodiversity department, and BSP Senior Scientist.	8 months, continuous	Report on research needs
3.1.2	Develop budgets and identification of funding sources	KWS, KFS, BSP, Rhino Ark, MKWC, and other relevant partners	8 months	No. of proposals developed and sent to potential donors
3.1.3	Secure funds to implement research needs.	KWS, BSP	2 years	Amount secured

Targets 3.2				
<ul style="list-style-type: none"> • 50% of remaining bongo, both wild and captive based on prevailing population estimates are genetically profiled, within 6 months. • Accurate estimates of wild population numbers, distribution and age-structure, within six months (using the profiling data to assist). • Utilising best practice and available data to identify genetically viable populations of mountain bongo which are as representative as possible of historic populations, within 1 year 				
Activities		Responsibility	Time-line	Indicators
3.2.1	Collect samples representative of at least 50% of all mountain bongo populations worldwide and have these independently analysed with the explicit remit of developing an evidence-based, global metapopulation management plan for mountain bongo.	<u>Sample analysis:</u> Paul Reillo and American Museum, University of Uppsala, Dr Muya. <u>Collection of data <i>in-situ</i> and transfer of samples to research sites:</u> BSP <u>Determination of other logistical details and responsibilities:</u> NBMC	6 months	Number of samples collected, and analysed
3.2.2	Collect accurate demographic, ecological and distribution data from bongo in the wild through localised studies.	KWS Senior Research Scientists in bongo ranges and BSP Senior Scientist.	6 months	Updated bongo population status report
3.2.3	Identify genetically viable populations of mountain bongo which are as representative as possible of historic populations	NBMC	1 year	Report on genetically viable populations

Targets 3.3				
<ul style="list-style-type: none"> • Best practice management for captive bongo populations • Best practice in reintroduction and translocation activities 				
Activities		Responsibility	Time-line	Indicators
3.3.1	Draft a comprehensive management plan for the MKWC release project detailing: <ul style="list-style-type: none"> • Management of the captive population to support release • Release protocols • post-release monitoring 	MKWC, KWS, NBMC	6 months	Management plan developed
3.3.2	<ul style="list-style-type: none"> • Draft a meta-population plan for captive (in-country and international) and wild populations, documenting desired genetic and demographic management, disease risk management and reintroduction strategies. 	KWS, NBMC with EEP, BSP, MKWC	9 months Ongoing	Meta-population management plan

	<ul style="list-style-type: none"> Apply best practice captive management (demographic, genetic, husbandry, disease risk management) to all in-country and international bongo populations. Apply best practice in reintroduction and translocation through close adherence to the IUCN Guidelines for Reintroduction. 			
3.3.3	<p>Convene independently facilitated workshops to achieve consensus within the National Bongo Management committee on the captive management and reintroduction-related issues described, in particular:</p> <ul style="list-style-type: none"> management of the MKWC herd towards the goal of conserving genetic diversity within Kenya; to incorporate in-country, international and wild populations into a global meta-population supporting long-term conservation goals, including strategies for genetic, demographic and disease risk management; Manage current and future reintroduction and translocation efforts. 	BTF/NBMC	Within 1 year	Workshop proceedings

Targets 3.4

“Habitat suitability” criteria for bongo are developed, and a thorough ecological assessment of potential sites based on these criteria conducted, to inform future reintroduction and translocation initiatives.

Activities	Responsibility	Time-line	Indicators
3.4.1 <ul style="list-style-type: none"> Develop “habitat suitability” criteria for bongo Conduct an ecological assessment of potential sites based on these criteria, to inform future reintroduction initiatives. 	KWS, KFS, NBMC	1 year	Habitat suitability assessment criteria developed; At least one ecological assessment undertaken

Strategic Objective 4

Communities: Optimise The Participation of Communities Living Adjacent to Bongo Habitat in Bongo Conservation.

Urgency ranking = 2

Importance ranking = 4

A major challenge for bongo conservation is that communities living adjacent to forests rely on forests and forest products for their livelihoods. For many, forests are the only sources of fuel, pasture, construction materials and even food which impacts on the bongo habitat.

Limited alternative livelihoods in local communities lead to continual encroachment of bongo habitat and opportunistic poaching. To address this challenges various organisations such as KFS, KWS, BSP, Rhino Ark, MKWT e.t.c. have established support programmes for communities living adjacent to forests.

Though direct evidence is difficult to gather, the experience of the agencies working in these communities supports the assumption that raising awareness of the plight of bongo, and of alternative livelihoods, can be beneficial in deterring poaching and ultimately encourage wildlife conservation. Direct feedback from communities has also been positive, however, more of this work is needed.

Valuable themes for alternative livelihood programmes include: use of alternative cooking fuels that do not rely on the forest, such as solar power, sawdust and cow dung; appropriate energy saving technologies; alternative methods of water harvesting; alternative, and swift methods of producing timber outside the forest. Communities living adjacent to forests are also an essential source of intelligence for enforcement and anti-corruption programmes.

Targets 4.1				
<ul style="list-style-type: none"> • Provide alternative means of livelihood • Livelihoods are diversified through support activities at the community level, that is, through the promotion of nature-based income-generating activities. 				
Activities		Responsibility	Time-line	Indicators
4.1.1	<ul style="list-style-type: none"> • Build community self-sufficiency in alternative livelihoods: • identify bush meat hotspots in bongo habitat areas; • identify/establish at least 2 community based organisations (CBOs) in each bongo habitat area; • identify NGOs and agencies working in the area and doing similar work e.g. Fisheries Dept, KWS, MKT, BSP, WHWF; • appraise CBOs to identify suitable projects and capacities/abilities; • draft suitable proposals for funding with all relevant stakeholders; • train CBO members where needed. 	KFS, KWS, MKT	3-5 years	Community livelihoods report, no. of proposals developed and funded, training reports
4.1.2	Incorporate alternative livelihood support activities into the actions above.	KFS, KWS, WHWF, MKT, Rhino Ark,	2-5 years	Number of alternative livelihood programs initiated

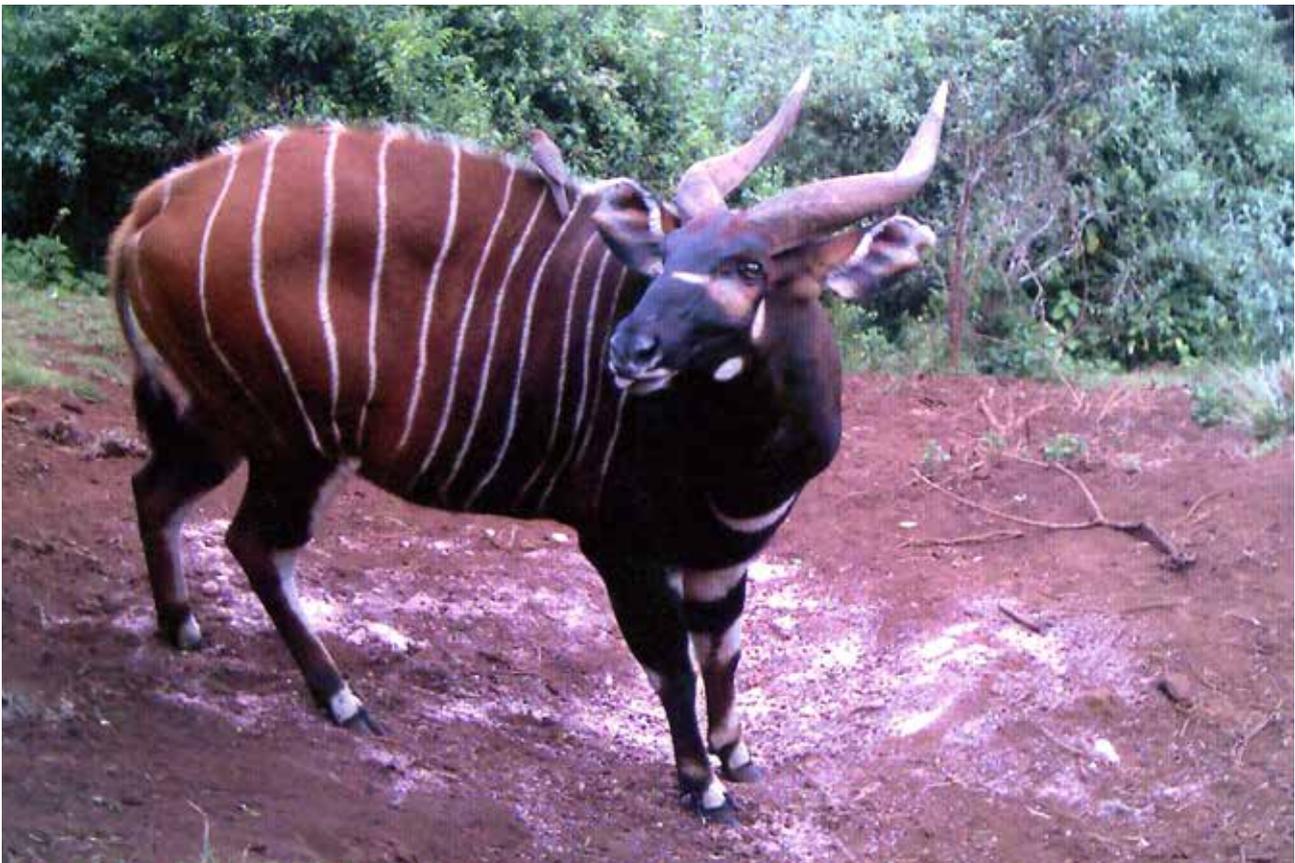




Targets 4.2

The involvement of communities living adjacent to mountain bongo habitat in bongo conservation, through education, awareness and livelihood improvement

Activities		Responsibility	Time-line	Indicators
4.2.1	Educate the local community on bongo conservation <ul style="list-style-type: none"> • identify NGOs and agencies providing environmental and wildlife education; • Co-ordinate efforts to cover a wider area, eliminate duplication and specifically target poaching hotspots and bongo habitats. 	KWS, KFS, WHWF, MKT, Rhino Ark,	2-5 years	Coordinated Community education programs in place
4.2.2	Develop bongo information, education and communication materials.	KWS, KFS, BSP and Rhino Ark	4 months	Education materials developed
4.2.3	Create awareness through in-house and outreach programmes.	KWS, KFS, BSP	Ongoing	Outreach programs conducted
4.2.4	Identify appropriate nature-based enterprises and promote: <ul style="list-style-type: none"> • alternative livelihoods in community areas with focus on high value options; • sources of cooking fuels that do not depend on forest products; • appropriate energy saving technology. • niche market-based farm forestry; 	KFS, Rhino Ark	1 year	Number of nature based enterprises



Strategic Objective 5

Policy Harmonization: To Ensure Policies Enhance Conservation Efforts for Mountain Bongos and Their Habitats.

Urgency ranking = 5

Importance ranking = 5

In some bongo habitats (Aberdare and Mt. Kenya), are in National Parks and Reserves managed by both KWS and KFS which are state agencies established with specific mandates. There is need to harmonise sectoral policies in management of this habitats to enhance bongo conservation.

Most bongos are found in forest reserves, the management of which falls under the auspices of KFS. Though the mandate of KFS is the conservation and sustainable management of forests and allied resources, its main role is in managing forest access to people, many of whom rely on forest resources as their main source of livelihood. KFS has no specific mandate to protect individual forest species – this responsibility lies with KWS. Integrating the species-specific needs of mountain bongos with broader forest use schemes is proving difficult as a result of this split responsibility between agencies.

The Forests (Participation in Sustainable Management) Rules, 2009, were gazetted to encourage private sector and forest community participation in forest management, directed towards garnering greater community support for forest conservation. In the new rules, forest-adjacent communities participate in forest management by forming Community Forest Associations (CFAs). These associations then work with KFS to develop Community Forest Management Plans and are then assigned forest user rights by entering into Community Forest Management Agreements with KFS. Formulation of Community Forest Management Plans (and forest management plans in general) is a critical point in terms of conserving bongos as influence by informed advocates at this point could help ensure that critical bongo habitat is zoned and managed appropriately.

Target 5.1				
Harmonization of policy issues that slow down conservation efforts for mountain bongos and their habitats				
Activities		Responsibility	Time-line	Indicator
5.1.1	Establish a National Bongo Management Committee (NBMC)	BTF	3 months	N B M C established
5.1.2	Harmonise KWS and KFS activities at bongo sites.	NBMC	6 months	Report
5.1.3	Develop and agree a set of rules or "Code of Conduct" in critical bongo habitat.	NBMC	1 year	Report

Target 5.2				
Encourage collaboration between government agencies and other stakeholders through participatory management planning.				
Activities		Responsibility	Time-line	Indicators
5.2.1	NGOs and other organisations, with Kenya Forest Working Group, to lobby for better management of forest areas.	KFS, KFWG	1 year	Number of engagement meetings
5.2.2	Establish a liaison office with help of KWS/ KFS/Kenya Forest Working Group /Local NGOs.	KWS/KFS/KFWG	1 year	Liaison office in place
5.2.3	Establish contact from each of the collaborators who can be responsible for recording and sharing information.	KWS/KFS/KFWG	1 year	Contact list

Strategic Objective 6

Law Enforcement and Prosecution: To Enhance Law Enforcement and Prosecution Through Engagement of Relevant Security Agencies, Office of The Director of Public Prosecutions and the Judiciary.

Urgency ranking = 6

Importance ranking = 6

The Wildlife Conservation and Management Act, 2013 provides a list of all nationally threatened species by name, threat status (e.g. Vulnerable, Endangered) and associated penalty. The Act provides for punitive sentences which is a deterrent to wildlife crime.

Engagement with the judiciary on poaching issues and its impact on species conservation may encourage more punitive sentencing.

Raising awareness to the general public on the provisions within the Act and encourage use of hot-line numbers could enhance reporting of illegal activities.

Target 6.1				
Enhance engagement with the judiciary with respect to the critical status of the mountain bongo.				
Activities		Responsibility	Time-line	Indicators
6.1.1	Conduct forums, workshops to build synergy with the judiciary on poaching issues and its impact on mountain bongo conservation	KWS, KWFG, KFS, MKT, BSP	1 year	Workshops / forums held



Strategic Objective 7

Species Interaction: To Minimise the Negative Impacts of Other Species, on Bongo.

Urgency ranking = 7

Importance ranking = 7

Species other than humans are causing loss of bongo and associated habitat. Threats have included: frequent livestock incursion during drought periods; fencing of parks like the Aberdare, which caused a concentration of elephants and consequent habitat destruction; and predation by, for example lions, which were introduced to the Aberdare.

Though fencing is generally agreed to have had a positive conservation impact it can lead to management problems. For example, where elephants are confined to small areas they will significantly degrade habitat. The opening up of migratory corridors in the Aberdare and restoring connectivity in the Mau and Eburu may remove some of the pressure.

Lions that were introduced to the Aberdare because they were causing conflict elsewhere were controlled in the late 1990's due to a decrease in bongo population. Thus, there should be no further translocations of predators to areas where they would not normally be found.

In considering remedial measures it is important to bear in mind the need to harmonise conservation strategies for all species involved. Management measures aimed at protecting bongo should not run contrary to conservation strategies for other species.

More information is needed about species interactions. A species-habitat interaction monitoring programme should be established under the responsibility of KWS and involving universities.

Target 7.1				
All species interactions negatively affecting bongo are minimised within five years.				
Activities		Responsibility	Time-line	Indicators
7.1.1	Develop and implement a habitat monitoring programme.	KWS	6 months/ Continuous	Monitoring programme in place
7.1.2	Identify possible areas of bongo habitat connectivity	KWS/KFS	5 years	Number of areas identified
7.1.3	Monitor populations of mega herbivores and predators in bongo areas.	KWS	Ongoing	Monitoring reports on species interaction

Strategic Objective 8

Disease: To Optimise The Assessment and Management of Disease Risk to Wild Bongos.

Urgency ranking = 8

Importance ranking = 7

Threats from existing as well as from unknown and emerging disease cannot be ruled out for bongo in Kenya, particularly where there is interaction with livestock. Anthrax is endemic in Kenya and affects all wild herbivores. Theileriosis or “corridor disease” and “East Coast Fever” are resident in buffalo and cattle and could spill over into other populations.

All bongo mortalities should be investigated through diagnostic necropsies. Mortality events in related species should be monitored and necropsies performed as necessary, and the bongo conservation programme should remain up to date on regional District Veterinary Officers (DVO) reports of livestock diseases.

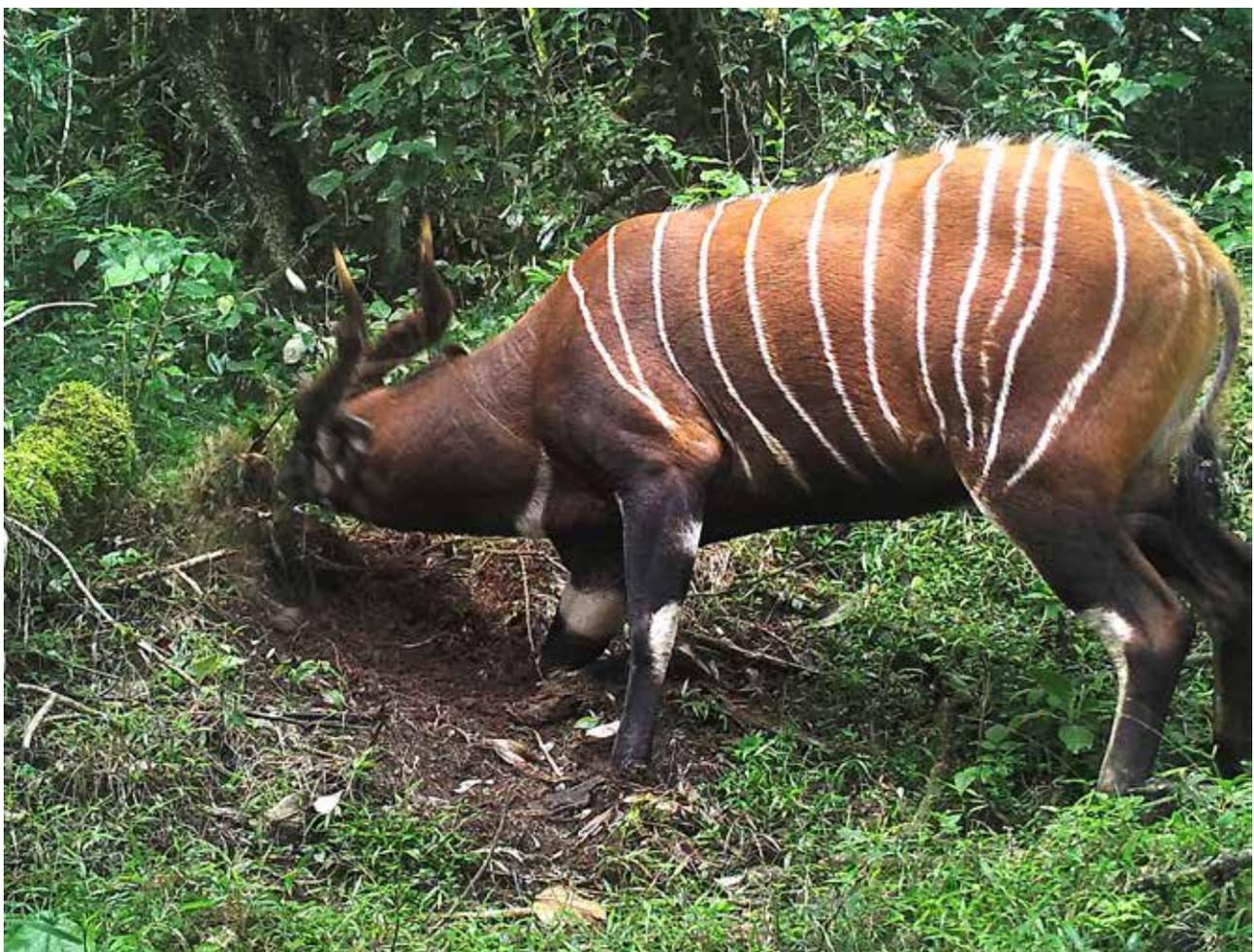
Bongos translocated from one area to another, or imported from outside Kenya, may arrive with diseases novel to the resident population or are exposed to unfamiliar diseases. In the event of importation or translocation and in accordance with IUCN guidelines, source and destination populations should be health-screened and appropriate risk assessment and management protocols set in place.

Imported mountain bongos have been shown to be immunologically naive and to succumb to indigenous disease e.g. theileriosis affected the bongos repatriated in 2004. Further work is required on the impact of disease on animals imported from outside Kenya with the aim of significantly reducing the incidence of mortality in future repatriation events. Recent Kenyan licensing of a cattle vaccination strategy involving “infect and treat” could be an initial area of investigation for immunisation/vaccination of mountain bongo.

Target 8.1				
Investigate all bongo diseases, performing diagnostic necropsies on mortalities and investigate mortality events in related species.				
Activities		Responsibility	Time-line	Indicators
8.1.1	Remain up-to-date on regional DVO reports relating to livestock disease events.	KWS regional warden and KWS DVS	Immediate and continuous	DVO reports on prevalence of livestock diseases
8.1.2	Intervene/respond to sick bongo cases	KWS-HVS, Regional KWS vet	Continuous	No. Of cases attended, Vet reports
8.1.3	Rapidly respond, investigate and perform necropsies on mountain bongo mortality events	KWS-HVS, Regional KWS Vet	Immediately and continuous.	No. Of cases attended, Vet reports
8.1.4	Investigate and necropsy mortality events in related species and range areas.	KWS HVS/ KWS regional vet	Immediately and continuous.	No. Of cases attended, Vet reports

Target 8.2				
Reduced mortality in any future bongo imports				
Activities	Responsibility		Time-line	Indicators
8.2.1	Develop a response to Theileria infection and other diseases affecting mountain bongo through test validation, vaccine methods, and treatment modalities.	KWS DVS, AZA or EAZA veterinarians responsible for the source population.	Continuous; Before repatriation.	Disease response protocol

Target 8.3				
To carry out health screening of source and destination populations and perform risk assessments in accordance with IUCN Reintroduction Specialist Group guidelines.				
Activities	Responsibility		Time-line	Indicators
8.3.1	Develop guidelines for relevant disease profiles, testing protocols and sample acquisition.	KWS DVS	Continuous before any animal translocation.	Guidelines on disease profiles, testing protocols and sample acquisition
8.3.2	Sample collection and analysis	DVS; KWS vet department	Continuous; Before any animal translocation.	Number of samples collected and analysed

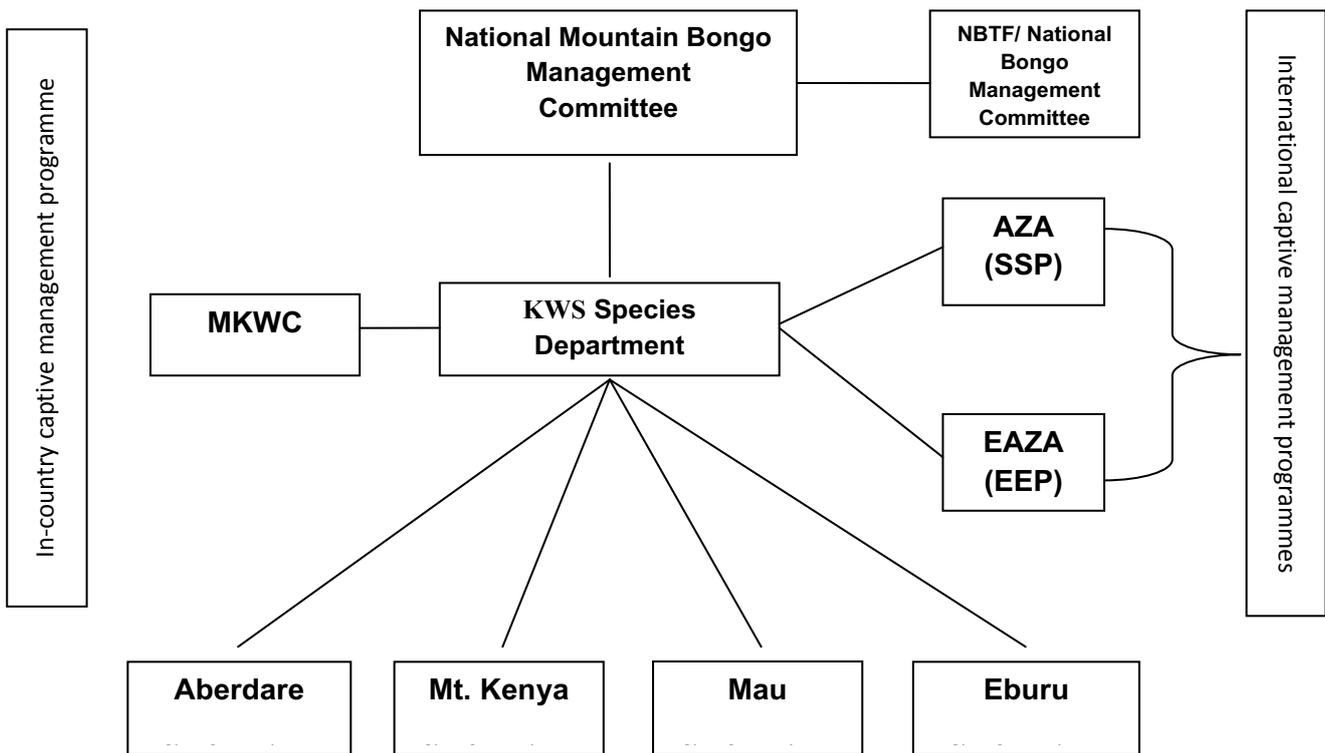


Chapter 5

Implementation of the National Recovery and Action Plan

Kenya Wildlife Service is the state agency responsible for conservation and management of wildlife in Kenya therefore is responsible for implementation of the conservation and management strategy for the mountain bongo in Kenya. Success will rely on close collaboration with relevant government agencies at National and County level, local communities, non-government organisations and other stakeholders committed to bongo conservation.

Figure 4: Implementation framework for delivery of the Recovery and Action Plan Bongo Conservation in Kenya



Details of this structure are as follows:

1. A National Bongo Management Committee will provide oversight, monitoring and evaluation of strategy implementation. The Committee will be co-chaired by KWS and KFS to ensure a harmonised approach
2. KWS Species Department will provide coordination and liaison for effective implementation of the strategy
3. Site Committees will be established for Mount Kenya, Aberdare, Mau, Eburu, Cherangani and any other areas hosting bongo populations. The committee will be comprised of relevant stakeholders at the site e.g. KWS, KFS, CFA's, community representatives, NGO's and County Government.
4. Various committee Technical Committee members will be coopted by the NBMC to provide advice as needed.
5. Local and international captive management programmes (EEP, SSP and the facility at Nanyuki) will be included in the framework as individual sites, each with its own management plan and committee. These programmes will be integrated into the broader framework through their representation in the NBMC.
6. Once this framework is in place the existing Bongo Task Force will be become the National Bongo Management Committee.
7. Terms of reference will be established for each element of the framework.
8. Implementation will begin following endorsement by the KWS and KFS Boards of Trustees

Mountain Bongo Task Force Taskforce Members

1. Dr. Patrick Omondi - Director – Biodiversity Research and Planning (Chair)
2. Dr. Shadrack Ngene - Assistant Director - Species Conservation and Management (Alternate Chair)
3. Wilson Korir - Assistant Director-Parks and Reserves
4. Dr. David Ndeereh - Head-Veterinary Services
5. Aggrey Maumo - Assistant Director – Central Rift Conservation Area
6. Simon Gitau - Assistant Director – Mountain Conservation Area
7. Dr. Fred Omengo - Senior Research Scientist – Mountain Conservation Area
8. Joseph Edebe - Senior Research Scientist – Central Rift Conservation Area
9. Linus Kariuki - Senior Research Scientist –Endangered species Programmes (Secretary)
10. James Mwang'ombe – Kenya Forest Service
11. Donald Bunge - Mount Kenya Game Ranch
12. Mike Prettejohn- Bongo Surveillance Program
13. Christian Lambrechts – Rhino Ark
14. Suzie Weeks – Mt. Kenya Trust
15. Ron Surratt - AZA Bongo SSP Coordinator
16. Colin Church – Trustee Rhino Ark

Terms Of Reference For The Mountain Bongo Task Force Taskforce

- Steer the formulation and implementation of national mountain bongo recovery plans that will ensure the long-term survival of healthy populations of the species and their habitats.
- Provide technical advice on the mountain bongo conservation and management matters including priorities for critical conservation actions for the species
- Advise on policy options for conservation and management of the mountain bongo
- Review mountain bongo research activities and advice on the appropriate research and monitoring programmes.
- Mobilize resources to formulate and implement national mountain bongo recovery plans and management guidelines.
- Raising the profile of the mountain bongo
- The taskforce will co-opt members outside the task force committee based on expertise, funding or other valid reasons identified by the committee

Appendix 1:

Strategic Objectives With Prioritisation Scores

Workshop-generated strategic objectives below are listed in order of total points allocated for both urgency and importance.

STRATEGIC OBJECTIVES	POINTS ALLOCATED		
	Urgency	Importance	Total
1. Security. To increase security by increasing the number of well-equipped security teams, mobilised teams and by creating a bongo conservation programme comprising, <u>for each population</u> : an Intensive Protection Zone (IPZ) to be staffed by a permanent security team of trained rangers.	25	50	75
2. Human Activities. to manage legal activities to ensure sustainability, and to stop illegal human activities that destroy mountain bongo habitat, through: <ul style="list-style-type: none"> a) zoning and demarcating controlled utilisation areas so that they do not interfere with bongo habitat b) stopping illegal activities in bongo habitat and in the whole ecosystem c) curtailing any further development of infrastructure in critical bongo habitats 	22	26	48
3. Policy Harmonisation. To ensure that all policy issues that threaten conservation of bongos and their habitat are harmonised within 1 year, by: <ul style="list-style-type: none"> a) establishing a national bongo conservation coordination committee; b) comprehensive mapping of existing and potential bongo habitat; c) development of protocols to guide bongo conservation (6 months). 	15	14	29
4. Resources and Research (small population-related). To identify bongo conservation and research needs over the next five years, construct budgets and identify funding sources within eight months. Secure funds to implement the conservation action plan within two years.	7	13	20
5. Captive Breeding. To achieve best practice in the management of all captive bongo populations and in all reintroduction and translocation activities, in support of mountain bongo conservation in Kenya.	14	4	18
6. Community Awareness. To coordinate efforts among awareness and education organisations, i.e. KWS, BSP, MKT, WHWF.	13	3	16

STRATEGIC OBJECTIVES	POINTS ALLOCATED		
	Urgency	Importance	Total
7. Limited Alternative Livelihoods. Support activities aimed at diversification of livelihoods, at the community level, through promotion of nature-based income generating activities.	2	11	13
8. Genetic. a) To profile 50% of all remaining bongo populations, both wild and captive, based on prevailing population estimates within 6 months. b) To develop a strategy which best secures genetically viable populations of mountain bongo which are as representative as possible of historic mountain bongo populations utilising best practice and all available data within one year.	6	5	11
9. Demographic. a) To provide more accurate estimates of wild populations within 6 months (using the profiling data to assist in population estimates). b) To develop a strategy which best secures demographically stable populations of mountain bongo whilst being mindful of genetic considerations utilising best practice and all available data within one year.	5	6	11
10. Community Issues. To ensure that communities living adjacent to bongo habitat are involved in bongo conservation through education awareness creation and livelihood improvement. Also, to identify livelihood options compatible with bongo conservation amongst prospective communities adjacent to bongo habitat.	8	0	8
11. Information Feedback Mechanisms. Improve information feedback systems by: a) Increasing awareness of KWS hot-line numbers and setting up new numbers and networks where needed. b) Encouraging the community to use hot-line numbers to report poaching activity (e.g. using toll free and reward systems). c) Improving information sharing between stakeholders	3	5	8
12. Prevailing poverty levels. To improve food security and protein sources, including from: a) fish farms; b) poultry, farmed rabbit; c) sack gardens; d) and to sensitise communities about the consequences of bush meat consumption: e) diseases; f) value of wildlife; g) legal implications.	7	0	7

STRATEGIC OBJECTIVES	POINTS ALLOCATED		
	Urgency	Importance	Total
13. Greater Inter-agency Cooperation. To encourage greater cooperation between government agencies and other stakeholders, by encouraging participatory management planning.	4	0	4
14. Lenient Penalties. To lobby for more punitive sentences and engage the judiciary to the critical status of the bongo.	1	3	4
15. Corruption. To encourage both individuals and community-based organisations on the boundaries of the forest to report corruption to the police and the Kenyan Anti-Corruption Commission (KACC).	2	1	3
16. Species Interaction. To ensure that all native species interactions affecting bongo conservation are minimised within 5 years by: <ul style="list-style-type: none"> a) developing a species/habitat interaction monitoring programme; b) opening up migratory corridors in fenced areas to ease pressure from mega-herbivores such as elephants and buffalos (habitat modifiers) 	1	0	1
17. Disease: <ul style="list-style-type: none"> a) To remain abreast of District Veterinary Officer (DVO) reporting, investigate all bongo mortalities, performing diagnostic necropsies where possible, and investigate mortality events in related species. b) To reduce mortality of any future bongo imports. c) In the case of reintroduction/translocation: to carry out health screening of source and destination populations and perform risk assessments in accordance with IUCN reintroduction specialist group guidelines. 	0	0	0

Appendix 2:

Strategic Plan Logical Framework

STRATEGIC OBJECTIVE 1 : SECURITY- to secure wild bongo populations				
Target	Activity	Responsibility	Time-line	Indicator
<p>Target 1.1 Increased number of well-equipped security teams.</p> <p>An Intensive Protection Zone (IPZ) established at each remaining bongo site.</p>	<p>Activity 1.1.1 Establish an Intensive Protection Zone (IPZ) at each bongo range, to be staffed by a permanent security team of trained rangers.</p>	KWS, KFS	6 months.	IPZ established
	<p>Enhance security operations of KWS/KFS within the bongo ranges in collaboration with partners.</p>	KWS, KFS	6-12 months	KFS and KWS Teams operational, Security reports
	<p>Enhance the coverage of BSP and existing community scouts in the Aberdare, Mt Kenya, and Eburu, and extend to west Mau and Londiani</p>	BSP, Community scouts, MWKT Rhino Ark	6-12 months	BSP monitoring reports
	<p>Activity 1.1.2 Capacity building for KWS, KFS rangers and train community scouts on bongo surveillance and monitoring skills.</p>	KWS, KFS, BSP, Community scouts, MWKT	As needed	Training report, Number of staff trained
<p>Target 1.2 Information sharing improved between stakeholders.</p> <p>Increased awareness of KFS/ KWS hotline numbers and new contacts and networks (toll-free numbers) set up where needed.</p> <p>Communities use hotline numbers to report illegal activity.</p>	<p>Activity 1.2.1 Establish mechanisms/platforms through which stakeholders can share information</p>	KFS, KWS	6 months	Number of platforms established and used Number of meetings held
	<p>Activity 1.2.2 Provide hotline numbers to communities and stakeholders through existing outreach programmes.</p>	KWS - senior warden of each national park, KFS, BSP, WHWF, MKT, Rhino Ark	6 months	Number of outreach programmes held, Toll free number/hotline availed to community members
	<p>Activity 1.2.3 Provide KWS and KFS toll-free numbers to be used in reporting illegal activities. Provide tie-ins with providers for collaboration, in the form of advertising /publicity</p>			
	<p>Activity 1.2.4 Establish a reward system for reports leading to arrest and/or successful prosecution.</p>			Number of arrests done in collaboration with community

STRATEGIC OBJECTIVE 2: HUMAN ACTIVITIES: to manage legal activities, stop illegal human activities that destroy mountain bongo habitat to ensure sustainability.				
Target	Activity	Responsibility	Time-line	Indicator
<p>Target 2.1 Legal activities that negatively impact bongo habitat are appropriately controlled.</p> <p>Illegal activities that that negatively impact bongo habitat, are stopped.</p>	<p>Activity 2.1.1 Minimise illegal activities in bongo ecosystems.</p>	KWS, KFS	On-going	% reduction of illegal activities
	<p>Activity 2.1.2 Control/regulate consumptive utilisation of bongo habitats (e.g. grazing, cultivation) as per site-specific plans.</p>	KFS	On-going	%reduction of use of 'bongo hotspots'
	<p>Activity 2.1.3 Zone and demarcate controlled utilization areas.</p>	KFS	On-going	Utilisation zones demarcated
	<p>Activity 2.1.4 Review existing ecosystem management plans to incorporate protection for critical bongo habitats.</p>	KWS, KFS	3 years	Reviewed ecosystem plan highlighting bongo habitats
	<p>Activity 2.1.5 Establish guidelines for undertaking comprehensive mapping of current and potential bongo habitats.</p>	NBMC	6 months	Guidelines established
	<p>Activity 2.1.6 Undertake comprehensive mapping of current and potential bongo habitat.</p>	NBMC	2 years	Bongo habitat map
	<p>Activity 2.1.7 Continuously monitor and survey bongo and their habitats.</p>	BSP	Ongoing	Survey reports

STRATEGIC OBJECTIVE 3: SMALL POPULATIONS: to use novel technologies to address the vulnerability of small and isolated bongo populations.				
Target	Activity	Responsibility	Time-line	Indicator
<p>Targets 3.1 Small population-related conservation and research needs over the next five years are identified</p> <p>Budgets developed and funding sources identified within eight months.</p> <p>Funds are secured to implement the conservation / research action plan within two years</p>	<p>Activity 3.1.1 Identify research needed (see also under genetic and demographic requirements) over the next five years to support conservation of bongo in the wild.</p>	<p>KWS - Senior Research Scientists in bongo ranges, KFS biodiversity department, and BSP Senior Scientist.</p>	<p>8 months, continuous</p>	<p>Report on research needs</p>
	<p>Activity 3.1.2 Develop budgets and identification of funding sources</p>	<p>KWS, KFS, BSP, Rhino Ark, MKWC, and other relevant partners</p>	<p>8 months</p>	<p>No. of proposals developed and sent to potential donors</p>
	<p>Activity 3.1.3 Secure funds to implement research needs.</p>	<p>KWS, BSP</p>	<p>2 years</p>	<p>Amount secured, Implementation report</p>
<p>Target</p> <p>Targets 3.2 50% of remaining bongo, both wild and captive based on prevailing population estimates are genetically profiled, within 6 months.</p> <p>Accurate estimates of wild population numbers, distribution and age-structure, within six months (using the profiling data to assist).</p> <p>Utilising best practice and available data to identify genetically viable populations of mountain bongo which are as representative as possible of historic populations, within 1 year</p>	<p>Activity</p> <p>Activity 3.2.1 Collect samples representative of at least 50% of all mountain bongo populations worldwide and have these independently analysed with the explicit remit of developing an evidence-based, global metapopulation management plan for mountain bongo.</p>	<p>Responsibility</p> <p>Sample analysis: Paul Reillo and American Museum, University of Uppsala, Dr Muya. Collection of data <u>in-situ</u> and transfer of samples to research sites: BSP Determination of other <u>logistical details</u> and <u>responsibilities</u>: NBMC</p>	<p>6 months</p>	<p>Indicator</p> <p>Number of samples collected, metapopulation management plan</p>
	<p>Activity 3.2.1 Collect accurate demographic, ecological and distribution data from bongo in the wild through localised studies.</p>	<p>KWS Senior Research Scientists in bongo ranges and BSP Senior Scientist.</p>	<p>6 months</p>	<p>Report on wild bongo population status</p>
	<p>Activity 3.2.1 Identify genetically viable populations of mountain bongo which are as representative as possible of historic populations</p>	<p>NBMC</p>	<p>1 year</p>	<p>Report on genetically viable populations identified</p>

<p>Targets 3.3 Best practice management for captive bongo populations</p> <p>Best practice in reintroduction and translocation activities</p>	<p>Activity 3.3.1 Draft a comprehensive management plan for the MKWC release project detailing: Management of the captive population to support release Release protocols post-release monitoring</p> <p>Activity 3.3.2 Draft a meta-population plan for captive (in-country and international) and wild populations, documenting desired genetic and demographic management, disease risk management and reintroduction strategies. Apply best practice captive management (demographic, genetic, husbandry, disease risk management) to all in-country and international bongo populations. Apply best practice in reintroduction and translocation through close adherence to the IUCN Guidelines for Reintroduction.</p> <p>Activity 3.3.3 Convene independently facilitated workshops to achieve consensus within the National Bongo Management committee on the captive management and reintroduction-related issues described, in particular: management of the MKWC herd towards the goal of conserving genetic diversity within Kenya; to incorporate in-country, international and wild populations into a global meta-population supporting long-term conservation goals, including strategies for genetic, demographic and disease risk management; Manage current and future reintroduction and translocation efforts.</p>	<p>MKWC, KWS, NBMC</p> <p>KWS, NBMC with EEP, BSP, MKWC</p> <p>BTF/NBMC</p>	<p>6 months</p> <p>9 months</p> <p>Ongoing</p>	<p>Management plan</p> <p>Meta-population plan</p> <p>Workshop proceedings</p>
--	--	---	--	--

<p>Targets 3.4 “Habitat suitability” criteria for bongo are developed, and a thorough ecological assessment of potential sites based on these criteria conducted, to inform future reintroduction and translocation initiatives.</p>	<p>Activity 3.4.1 Develop “habitat suitability” criteria for bongo Conduct an ecological assessment of potential sites based on these criteria, to inform future reintroduction initiatives.</p>	<p>KWS, KFS, NBMC</p>	<p>1 year</p>	<p>Habitat suitability criteria developed, At least one ecological assessment undertaken</p>
<p>STRATEGIC OBJECTIVE 4: COMMUNITIES: optimise the participation of communities living adjacent to bongo habitat in bongo conservation.</p>				
<p>Target Targets 4.1 Provide alternative means of livelihood Livelihoods are diversified through support activities at the community level, that is, through the promotion of nature-based income-generating activities.</p>	<p>Activity Activity 4.1.1 Build community self-sufficiency in alternative livelihoods: identify bush meat hotspots in bongo habitat areas; identify/establish at least 2 community based organisations (CBOs) in each bongo habitat area; identify NGOs and agencies working in the area and doing similar work e.g. Fisheries Dept, KWS, MKT, BSP, WHWF; appraise CBOs to identify suitable projects and capacities/abilities; draft suitable proposals for funding with all relevant stakeholders; Train CBO members where needed.</p>	<p>Responsibility KFS, KWS, MKT</p>	<p>Time-line 3-5 years</p>	<p>Indicator Community livelihoods report, No. of proposals developed and funded, Training reports Number of alternative livelihood programs initiated</p>
<p>Activity 4.1.2 Incorporate alternative livelihood support activities into the actions above.</p>	<p>KFS, KWS, WHWF, MKT, Rhino Ark,</p>	<p>2-5 years</p>		

<p>Targets 4.2 The involvement of communities living adjacent to mountain bongo habitat in bongo conservation, through education, awareness and livelihood improvement</p>	<p>Activity 4.2.1 Educate the local community on bongo conservation identify NGOs and agencies providing environmental and wildlife education; Co-ordinate efforts to cover a wider area, eliminate duplication and specifically target poaching hotspots and bongo habitats.</p>	<p>KWS, KFS, WHWF, MKT, Rhino Ark,</p>	<p>2-5 years</p>	<p>Coordinated Community education programs in place</p>
	<p>Activity 4.2.2 Develop bongo information, education and communication materials.</p>	<p>KWS, KFS, BSP and Rhino Ark</p>	<p>4 months</p>	<p>Education materials developed</p>
	<p>Create awareness through in-house and outreach programmes.</p>	<p>KWS, KFS, BSP</p>	<p>Ongoing</p>	<p>Outreach programs conducted</p>
	<p>Activity 4.2.3 Identify appropriate nature-based enterprises and promote: alternative livelihoods in community areas with focus on high value options; sources of cooking fuels that do not depend on forest products; Appropriate energy saving technology. niche market-based farm forestry;</p>	<p>KFS, Rhino Ark</p>	<p>1 year</p>	<p>Number of nature based enterprises identified</p>
<p>STRATEGIC OBJECTIVE 5: POLICY HARMONIZATION: to ensure policies enhance conservation efforts for mountain bongos and their habitats.</p>				
<p>Target 5.1 Harmonization of policy issues that slow down conservation efforts for mountain bongos and their habitats</p>	<p>Activity 5.2.1 NGOs and other organisations, with Kenya Forest Working Group, to lobby for better management of forest areas.</p>	<p>KFS, KFWG</p>	<p>1 year</p>	<p>Indicator Improved management</p>
	<p>Activity 5.2.1 Establish a liaison office with help of KWS/KFS/Kenya Forest Working Group /Local NGOs.</p>	<p>KWS/KFS/KFWG</p>	<p>1 year</p>	<p>Liaison office in place</p>
	<p>Activity 5.2.1 Establish contact from each of the collaborators who can be responsible for recording and sharing information.</p>	<p>KWS/KFS/KFWG</p>	<p>1 year</p>	<p>Contact list</p>

STRATEGIC OBJECTIVE 6: LAW ENFORCEMENT AND PROSECUTION - to enhance law enforcement and prosecution through engagement of relevant security agencies, office of the director of public prosecutions and the judiciary.			
Target	Activity	Responsibility	Indicator
Target 6.1 Enhance engagement with the judiciary with respect to the critical status of the mountain bongo.	Activity 6.1.1 Conduct forums, workshops to build synergy with the judiciary on poaching issues and its impact on mountain bongo conservation	KWS, KWFG, KFS, MKT, BSP	Workshops/forums held, Number of punitive sentences given
STRATEGIC OBJECTIVE 7: SPECIES INTERACTION - to minimise the negative impacts of other species, on bongo.			
Target	Activity	Responsibility	Indicator
Target 7.1 All species interactions negatively affecting bongo are minimised within five years.	Activity 7.1.1 Develop and implement a habitat monitoring programme.	KWS	Monitoring programme in place
	Activity 7.1.2 Identify possible areas of bongo habitat connectivity	KWS/KFS	Number of areas identified
	Activity 7.1.3 Monitor populations of mega herbivores and predators in bongo areas.	KWS	Monitoring reports on species interaction
STRATEGIC OBJECTIVE 8: DISEASE - to optimise the assessment and management of disease risk to wild bongos.			
Target	Activity	Responsibility	Indicator
Target 8.1 Investigate all bongo disease cases, perform diagnostic necropsies on mortalities, and investigate mortality events in related species.	Activity 8.1.1 Remain up-to-date on regional DVO reports relating to livestock disease events.	KWS regional warden and KWS DVS	DVO reports on prevalence of livestock diseases
	Activity 8.1.2 Treatment of sick bongo cases	KWS-HVS, Regional KWS vet	No. Of cases attended, Vet reports
	Activity 8.1.3 Rapidly respond, investigate and perform necropsies on mountain bongo mortality events	KWS-HVS, Regional KWS ranger staff	No. Of cases attended, Vet reports
	Activity 8.1.4 Investigate and necropsy mortality events in related species and range areas.	KWS HVS	No. Of cases attended, Vet reports

<p>Target 8.2 Reduced mortality in any future bongo imports</p>	<p>Activity 8.2.1 Develop a response to Theileria infection and other diseases affecting mountain bongo through test validation, vaccine methods, and treatment modalities.</p>	<p>KWS DVS, AZA or EAZA veterinarians responsible for the source population.</p>	<p>Before repatriation.</p>	<p>Disease response protocol</p>
<p>Target 8.3 To carry out health screening of source and destination populations and perform risk assessments in accordance with IUCN Reintroduction Specialist Group guidelines.</p>	<p>Activity 8.3.1 Develop guidelines for relevant disease profiles, testing protocols and sample acquisition.</p>	<p>KWS Vet Department; DVS</p>	<p>Continuous; Before any animal translocation.</p>	<p>Guidelines on disease profiles, Testing protocols and sample acquisition</p>
	<p>Activity 8.3.2 Sample collection and analysis</p>	<p>KWS Vet Department; DVS</p>	<p>Opportunistically during interventions; Before any animal translocation.</p>	<p>Number of samples acquired and tests done</p>

Appendix 3:

Identification, monitoring, Body Scoring of Bongos

By: Tommaso Sandri, Fred Omengo, Bradley Cain, Martin Jones, Dave Mallon & Ed Harris

Introduction

Protocol to aid in the conservation and Management of the Bongo:

- i. A bespoke ID-System for bongo identification
- ii. A quantitative method to identify bongo spoor in areas where waterbuck and bongo are sympatric
- iii. Camera trapping protocol for monitoring
- iv. The application of a pre-existing Body Condition Scoring (BCS) system to the captive bongo herd at MKWC

I) ID-system

The lack of an identification system is a major impediment to the long-term monitoring of any animal population of conservation concern (Legg & Nagy 2006). Here we describe a user based visual ID-system that requires little training, and is fast and transferable.

The ID system was initially developed on the captive herd at the Mount Kenya Wildlife Conservancy (MKWC). The system relies on individual features of bongo flanks (Figure 1). Of these, stripe pattern have been found previously to be important for individual identification (Gibbon et al. 2015).

The system was tested for its transferability amongst multiple observers through the analysis of inter-relator reliability (irr, Hallgren 2012) using K statistics (Fleiss 1971, Landis & Koch 1977), where the closer the value of K to 1 the higher the agreement amongst observers. 15 naïve observers, who are neither trained in the system nor bongo experts, were asked to ID 10 bongo flanks. The results show a substantial agreement (average K = 0.65) amongst the 15 observers, thus showing that the ID-system here presented is transferable, reliable and can become a useful tool for long-term monitoring (Figure 2).

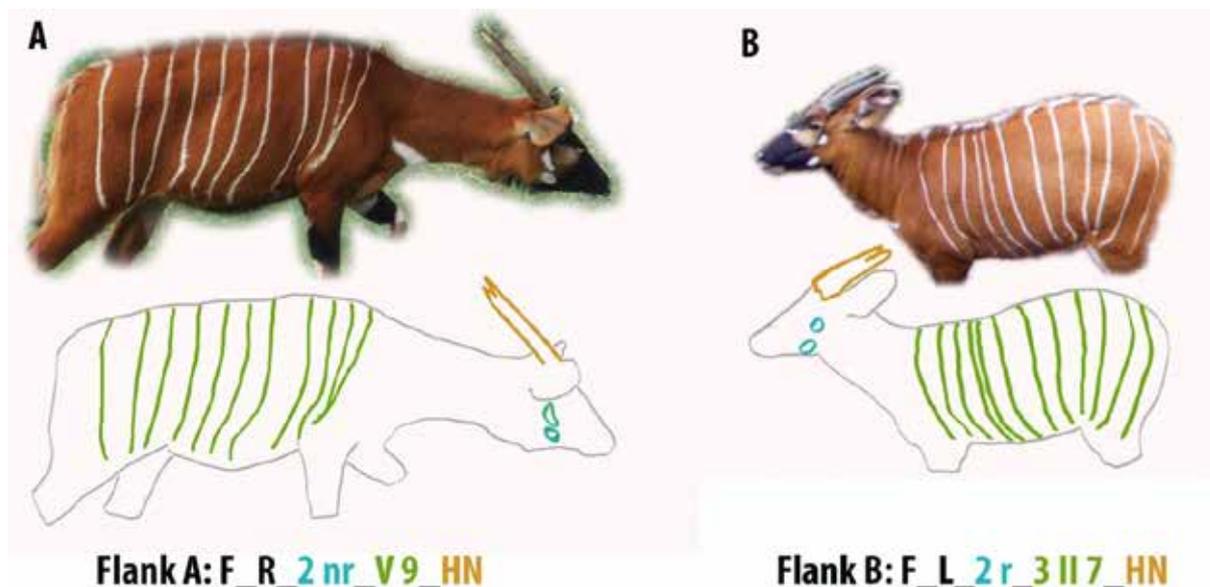


Figure 1: Example of our newly developed ID-system for bongo flanks: Flank A is coded as F (female), R (right flank), 2 nr (two facial spots, upper spot is not round), V (2 stripes converge), 9 (nine stripes with no peculiar feature), HN (horns appear normal). Flank B is coded as F (female), L (left flank) 2r (two facial spots, upper is round), 3 (three stripes with no peculiar feature), II (two stripes appear narrower than the others on the animal's flank), 7 (seven stripes with no peculiar feature), HN (horns appear normal).



Figure 2: BSP picture taken in the Salient (ANP) with individuals with the ID system code assigned by BSP.

II) Track identification method

The identification of bongo tracks is generally not problematic, however in areas where both bongo and the similarly sized waterbuck (*Kobus ellipsiprymnus*) are sympatric, misidentification can occur and waterbuck spoor can be wrongly identified as bongo (Faria et al. 2011). Misidentification of spoor can obviously have a significant impact on the reliability of any monitoring programme.

In an attempt to increase monitoring reliability, we have developed a quantitative method for distinguishing between the spoor of the two species. Thanks to the access to MKWC captive herd, we measured 100 bongo tracks and 50 waterbuck tracks. We opportunistically sampled and measured tracks in enclosed areas within the conservancy where only one of the target species was present. Our sampling did not differentiate among age-classes or sexes. Our results show that the length to width ratio (LW) averages 1.2 (± 0.15) for bongo and 1.5 (± 0.13) for waterbuck (Figure 3). A 2-sample t test found the difference to be significant ($p < 0.0001$). Subsequently, we included LW in a logistic regression (Dreiseitl & Ohno-Machado 2002) as a predictor of the species. Results show an AUC, a measure of predictive reliability of the logistic regression, of 0.90 out of a maximum value of 1.

The incorporation of two simple measurements easily retrievable in the field should greatly increase the reliability of bongo monitoring through spoor.

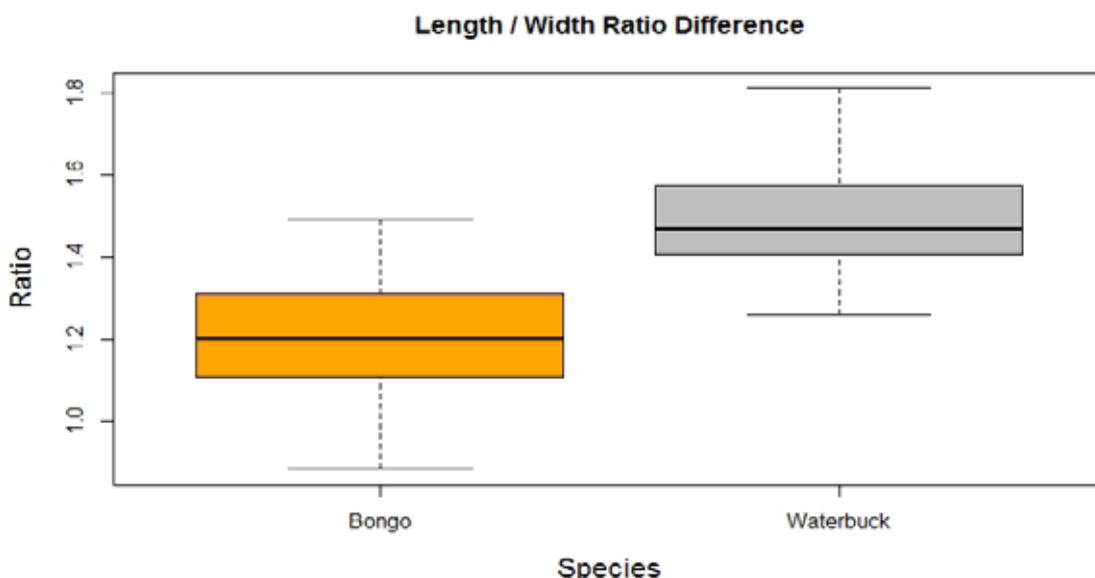


Figure 3: The plot shows the difference in length to width ration between bongo tracks and waterbuck tracks

III) Camera trap protocol

The method is adopted from (O' Connel et al. 2011) on using camera traps to collect data for the development of a Habitat Suitability Model (HSM) for bongo. The use of both presence and absence points is considered the most accurate (Guillera-Arroita et al. 2015) method. In order to retrieve both presence and absences we implemented a random sampling covering the available habitat in the area of interest (Hirzel & Guisan 2002).

Cameras are placed at 1km from one another in a grid array. The devices are installed facing active game trails and tied on robust trees (to avoid interference from wind) and at a height of at least 1.5 m (to avoid disturbance from hyenas). Cameras are set to take 3 photographs per capture event during both day and night. Cameras are left in place for at least 10 nights.

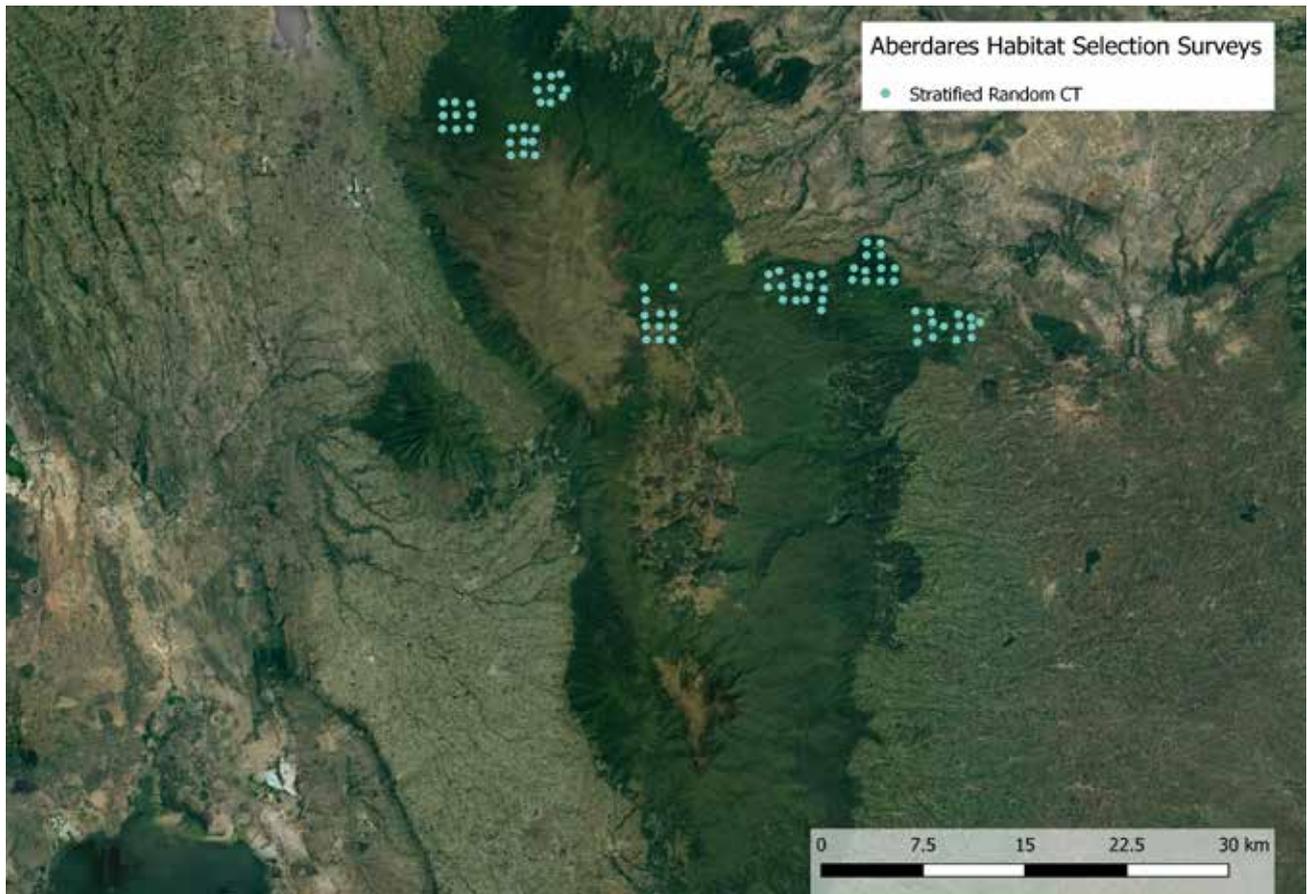


Figure 4: Map of bongo habitat selection survey sites in the Aberdare



Figure 5: A young male at the Salient (ANP, August 2018)

IV) Body Condition Scoring System

Assessing and evaluating the condition of individuals is of primary interest for conservation actions (Stevenson & Woods 2006). Captive individuals can be assessed for their suitability for release or breeding purposes and they can then be monitored after release using a standardised body condition system.

The use of a standardised system allows multiple practitioners to objectively evaluate the body condition of an individual animal. A standard system for monitoring body condition can be used to assess the welfare of captive individuals, which is relevant for their reproductive output. In order to assess the status of the bongo herd at MKWC we implemented a system previously designed for captive mountain bongo by Disney (Disney Animal Programs 2005, Figure 6). BCS scoring relies on visually estimating the amount of accumulated fat over various body parts (Wright et al. 2011).

The system was applied through photographic records of each individual rather than live encounter in order to test its applicability on pictures. This would allow the system to be remotely applied to individuals captured from camera traps. A mean body condition of 3.2 was obtained with the lowest score being 1 (found in one individual) and 4 (in 13 individuals) being the maximum (Figure 7 for examples). No individual was found to be obese (score 5). The scores appear comparable with results from a previous analysis in UK zoos (Wright et al. 2011).

Results from the captive herd were compared with wild individuals in the Salient area of the Aberdare NP. The wild individuals were scored using photographs retrieved from both MMU and BSP where the flank was clearly visible. The wild individuals' mean BCS was 2.9 showing no significant difference to that of the captive MKWC population (Wilcoxon test: $P > 0.05$; Figure 8)

The application of an internationally recognised scoring system allows for the comparison of the MKWC herd with other institutions worldwide. Besides, the application of a standardised system will allow practitioners and managers to both evaluate individuals for their suitability for reintroduction and, when paired with a reliable ID-system, monitor individuals following the release.

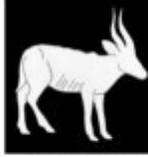
Score	1: Emaciated	2: Thin	3: Good	4: Fat	5: Obese
Outline Depictions					
Neck & Shoulders	<ul style="list-style-type: none"> Emaciated Bone structure is easily visible No fat 	<ul style="list-style-type: none"> Neck is thin Decreased girth 	<ul style="list-style-type: none"> Neck is thick Shoulders are flat 	<ul style="list-style-type: none"> Neck is thick Fat deposits evident Shoulders slightly rounded 	<ul style="list-style-type: none"> Fat is evident along neck Bulging fat Neck is thick Neck blends into shoulder Shoulders are rounded
Withers	<ul style="list-style-type: none"> Emaciated Bone structure is easily visible No fat 	<ul style="list-style-type: none"> Thin Bone structure is evident 	<ul style="list-style-type: none"> Withers has fat deposits Decreasing visibility of bone structure 	<ul style="list-style-type: none"> Fat deposits are evident 	<ul style="list-style-type: none"> Fat deposits make withers appear flatter/ less discernable
Loin & Back	<ul style="list-style-type: none"> Emaciated Spinous processes are easily identifiable 	<ul style="list-style-type: none"> Spinous processes are not individually identifiable, but spine is still prominent Transverse processes faintly discernable 	<ul style="list-style-type: none"> Back is sloped to withers 	<ul style="list-style-type: none"> Fat deposits are present Back appears flatter 	<ul style="list-style-type: none"> Wide back Patchy fat Back is flat
Tail head & Hips	<ul style="list-style-type: none"> Pelvic bones are very prominent 	<ul style="list-style-type: none"> Pelvis bones at the point of the hip are rounded, but still evident Pelvic bones at rump may be slightly discernable 	<ul style="list-style-type: none"> Fat is present around tail head Pelvic bones are flat 	<ul style="list-style-type: none"> Hips are rounded 	<ul style="list-style-type: none"> Hips/thighs are very round
Ribs	<ul style="list-style-type: none"> Emaciated Rib spacing appears wide and depressed 	<ul style="list-style-type: none"> Ribs still discernable, but fat is discernable by touch 	<ul style="list-style-type: none"> Ribs are not visible, but discernable by touch 	<ul style="list-style-type: none"> Ribs are not visible Fat deposits may be evident 	<ul style="list-style-type: none"> Fat deposits may be present, easily evident

Figure 6: Bongo Body Condition Scoring System (Disney Animal Programs, 2005), figure from Wright et al. 2011.

Difference in BCS between Salient (ANP) and MKWC

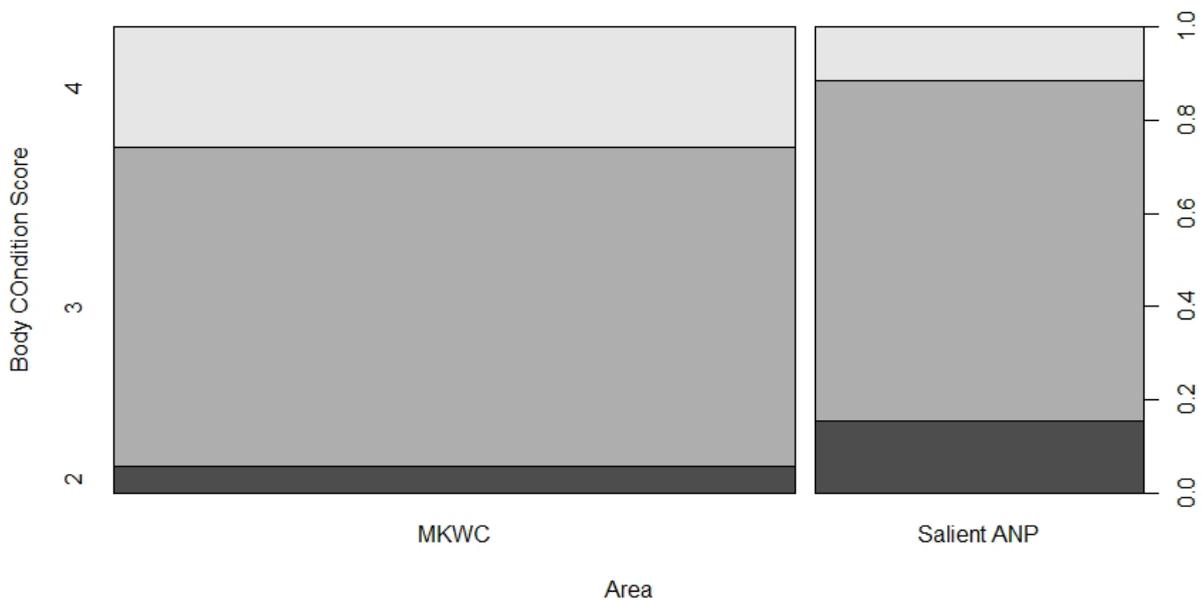


Figure 7: Body Condition Score in the Salient (ANP) and in captivity (MKWC)

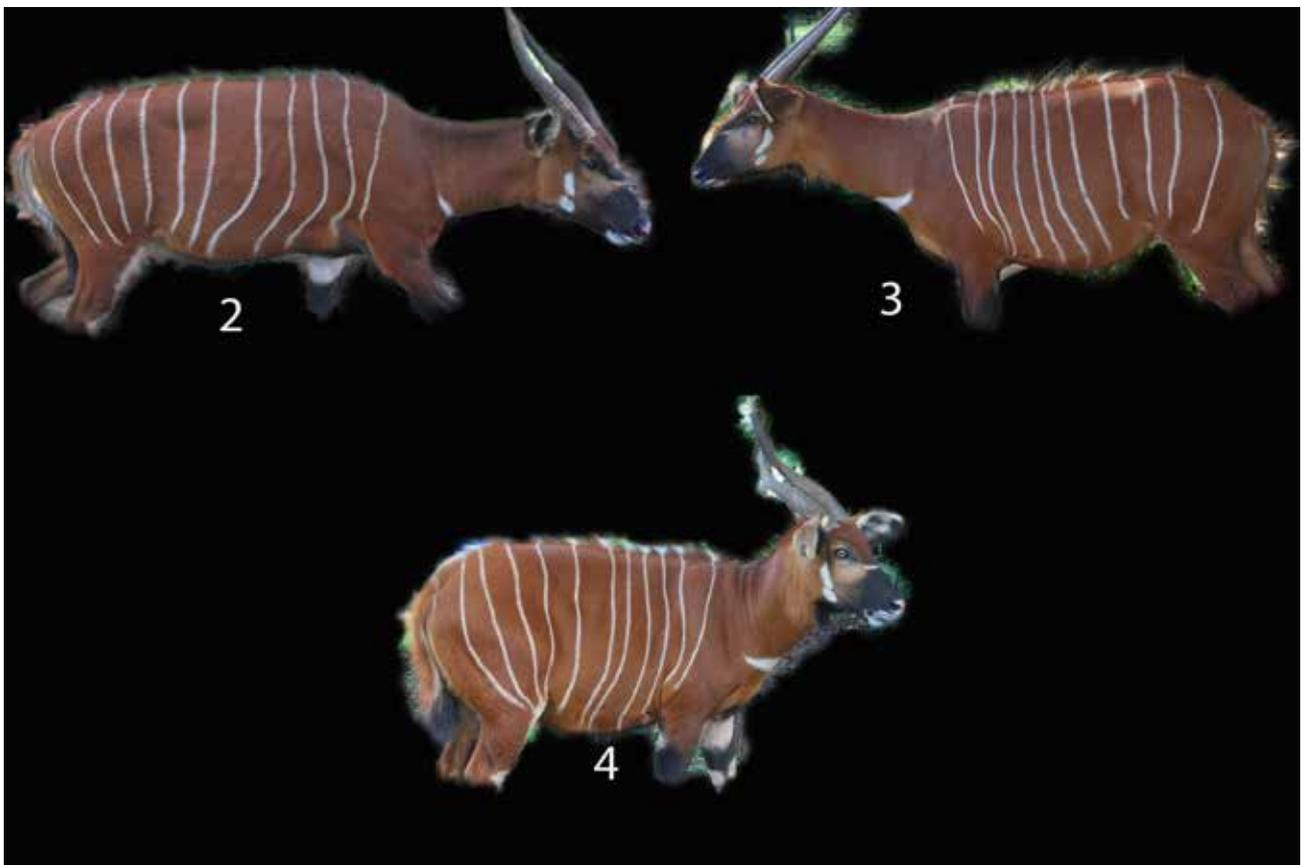
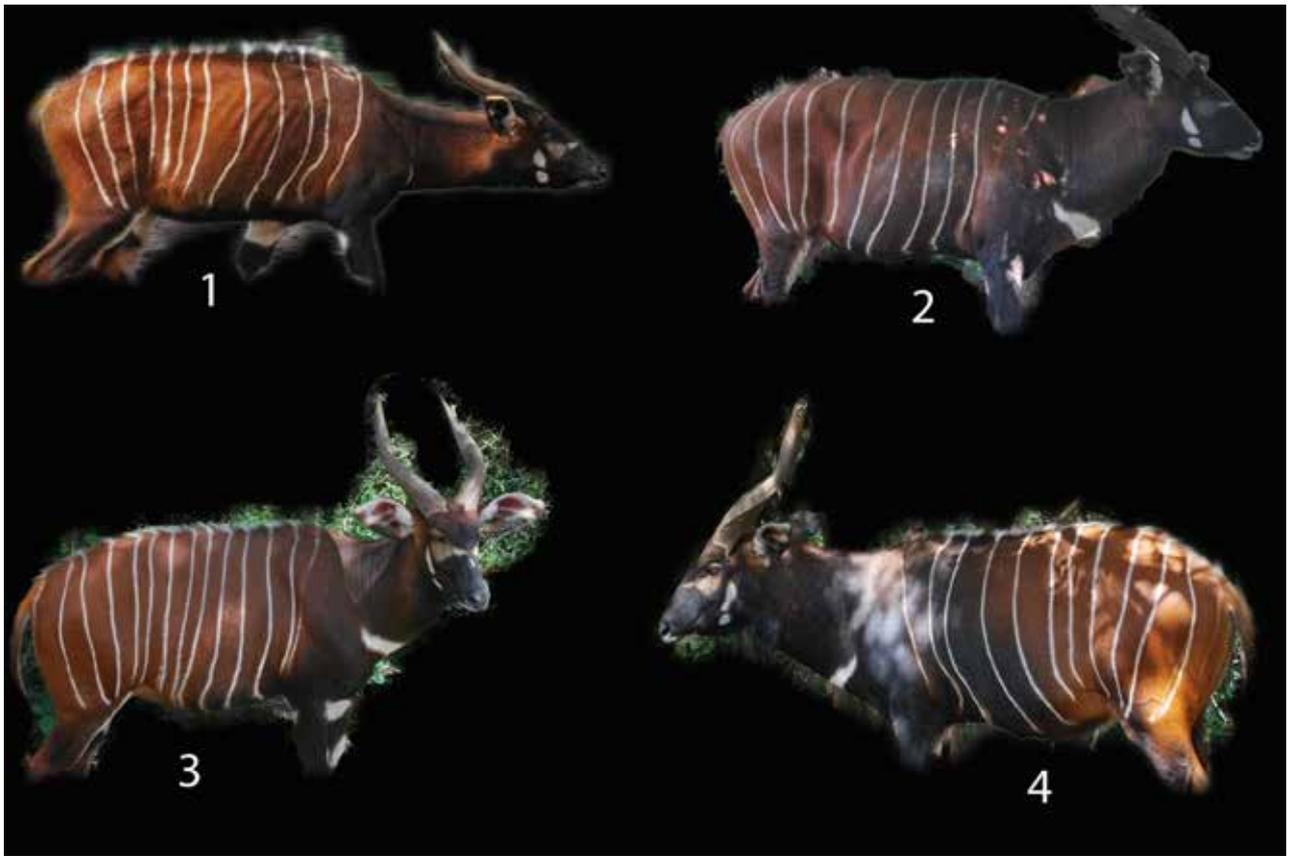
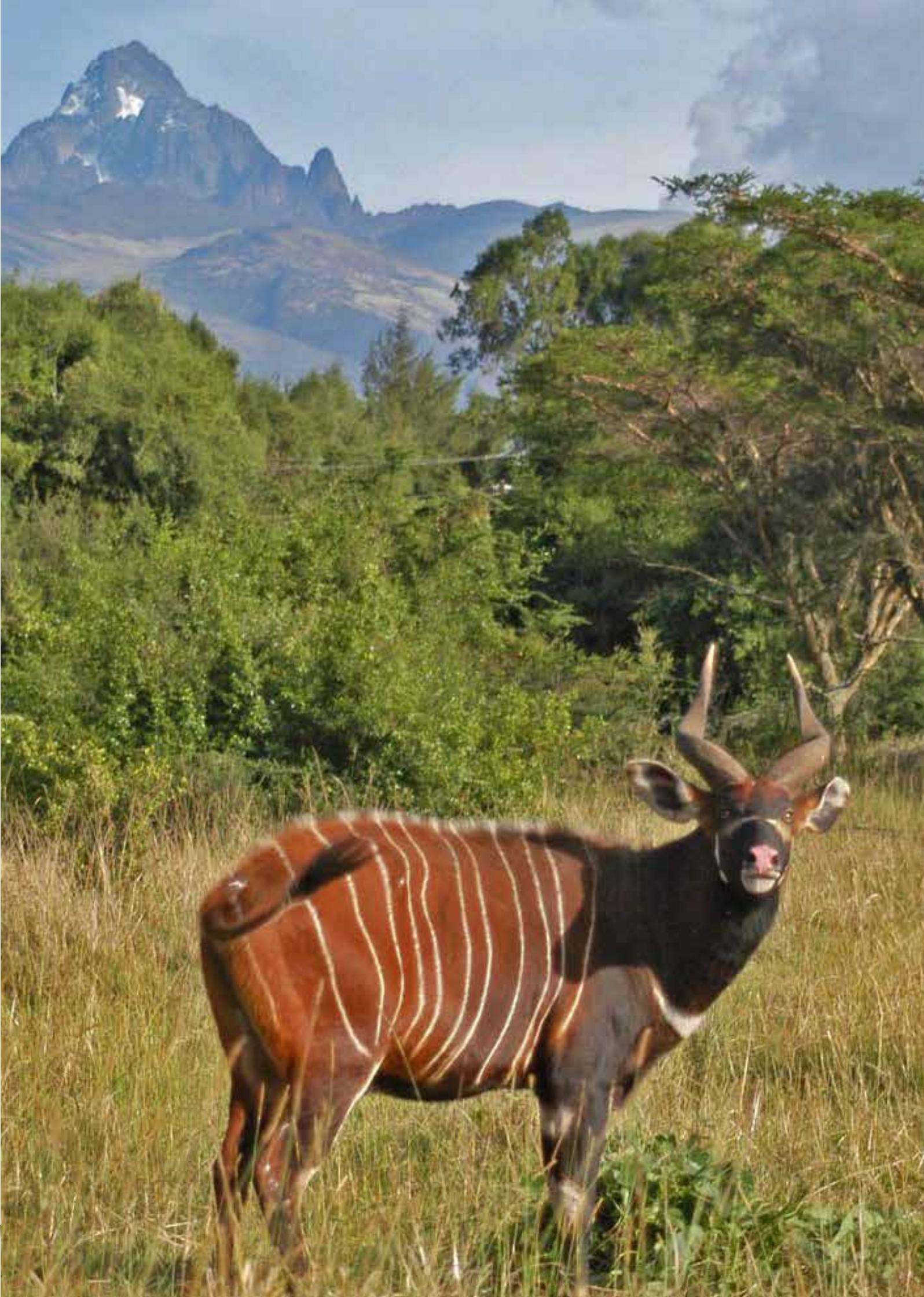


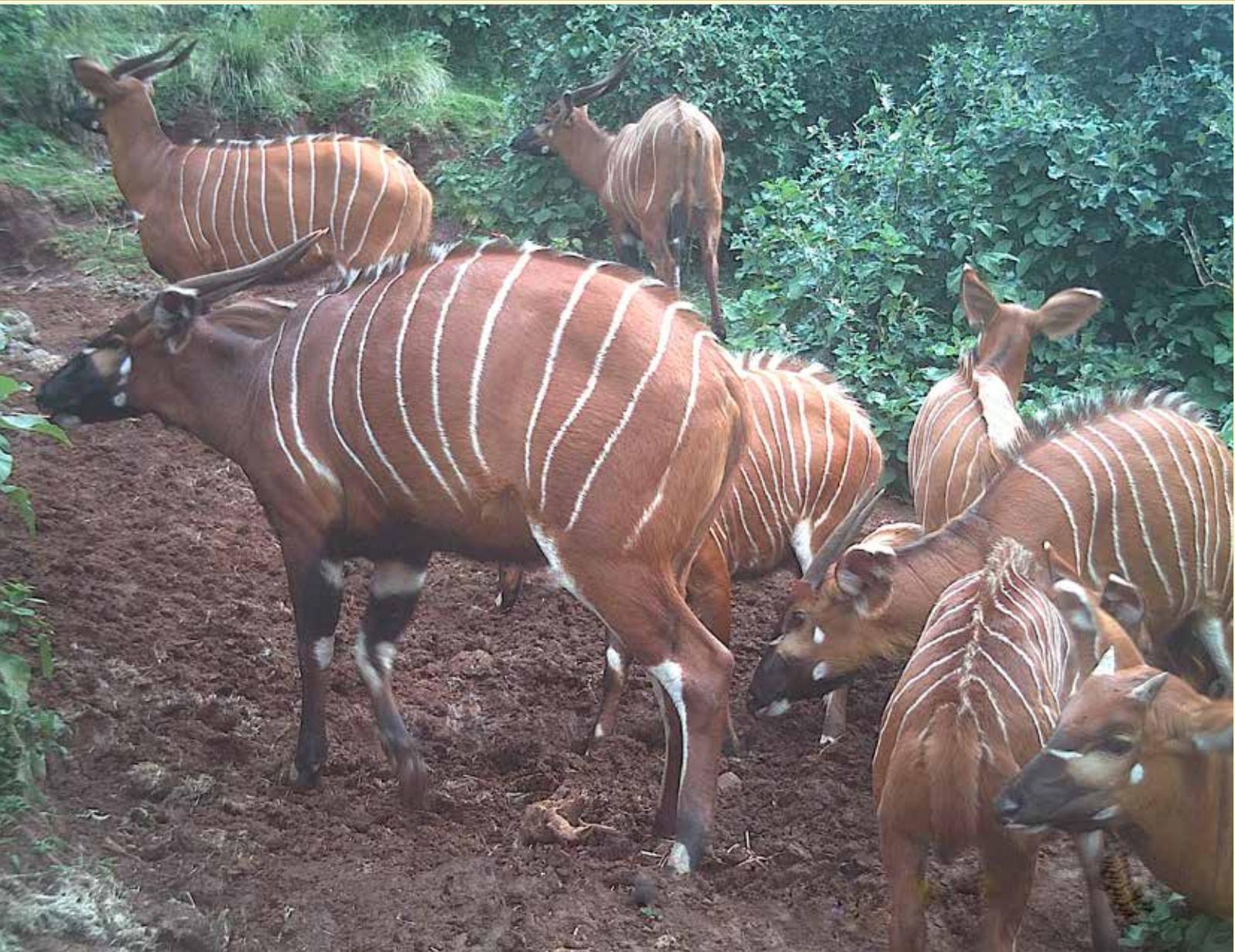
Figure 8: The image shows examples of bongo individuals from MKWC captive herd with relative body score assigned following the Disney scoring system.

References

- Brooke, B.W., L.W. Traill and C.J.A. Bradshaw (2006). Minimum viable populations and global extinction risk are unrelated. *Ecology Letters* 9: 375-382
- Davis G., 1993. Who killed the bongo in Mau. *East African National History bulletin*, Vol. 23 no. 1
- Disney Animal Programs. 2005. Bongo body condition scores, Disney animal programs. Lake Buena Vista, FL: Disney's Animal Kingdom.
- Dorst, J. and Dandelot, P. 1970. *Collins Field Guide to Larger Mammals of Africa*. Harper Collins Publishers: London.
- Dreiseitl, S. & Ohno-Machado, L., 2002. Logistic regression and artificial neural network classification models: A methodology review. *Journal of Biomedical Informatics*, 35(5-6), pp.352-359.
- Estes L.D., Okin G.S., Mwangi A.G. and Shugart H.H. 2008. Habitat selection by a rare forest antelope: A multi-scale approach combining field data and imagery from three sensors. *Remote Sensing of Environment* 112: 2033-2050.
- Estes L.D., Reillo P.R., Mwangi A.G., Okin G.S. and Shugart H.H. 2010. Remote sensing of structural complexity indices for habitat and species distribution modeling. *Remote Sensing of Environment* 114: 792-804.
- Estes, L.D., Mwangi, A.G., Reillo, P.R., Shugart, H.H. in press. Enhanced Remote Sensing and Multiple Validation Techniques to Improve Predictive Distribution Modeling of Rare Species
- Estes, R.D. 1991. *The Behaviour Guide to African Mammals*. University of California Press, London.
- Faria, P.J. et al., 2011. The use of non-invasive molecular techniques to confirm the presence of mountain bongo *Tragelaphus eurycerus isaaci* populations in Kenya and preliminary inference of their mitochondrial genetic variation. *Conservation Genetics*, 12(3), pp.745-751.
- Fleiss, J.L., 1971. Measuring nominal scale agreement among many raters. *Psychological Bulletin*, 76(5), pp.378-382.
- Franklin, I.R. (1980). Evolutionary change in small populations. Pp. 135-150 In: M.E. Soulé and B.A.
- Gibbon, G.E.M., Bindemann, M. & Roberts, D.L., 2015. Factors affecting the identification of individual mountain bongo antelope. *PeerJ*, 3, p.1303.
- Guillera-Arroita, G. et al., 2015. Is my species distribution model fit for purpose? Matching data and models to applications. *Global Ecology and Biogeography*, 24(3), pp.276-292.
- Hallgren, K.A., 2012. Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutorials in quantitative methods for psychology*, 8(1), pp.23-34.
- Hillman, J.C. 1986. Aspects of the biology of the bongo antelope *Tragelaphus eurycerus* (Ogilby 1837) in south west Sudan. *Biological Conservation* 38: 255 - 272.
- Hillman, J.C. and Gwynne, M. D. 1987. Feeding of the Bongo antelope *Tragelaphus eurycerus* (Ogilby 1837), in south west Sudan. *Mammalia* 51, 53 - 63.
- Hirzel, A. & Guisan, A., 2002. Which is the optimal sampling strategy for habitat suitability modelling. *Ecological Modelling*, 157(2-3), pp.331-341.
- Kingdon, J. 1982. *East African Mammals. An atlas of Evolution in Africa*. Academic Press: London.
- Klaus, G., Klaus-Hugi, C. and Schmid, B. 1999. Geophagy by large mammals at natural licks in the rain forest of the Dzanga National Park, Central African Republic. *J. trop. Ecol.* 14: 829-839.
- Klaus-Hugi, C., Klaus, G. and Schmid, M. 2000. Movement patterns and home range of bongo (*Tragelaphus eurycerus*) in the rain forest of the Dzanga National Park, Central African Republic. *Afri. J. Ecol.* 38: 53-61.
- KWS, 1991. Management plan for Aberdare National Park 1991-1996, Nairobi, Kenya.

- Lam, J.A. 1999. Population estimates, habitat utilization, distribution and conservation of Bongo (*Boocercus eurycerus*) in the Aberdare National Park, Kenya. M.Sc. Thesis Moi University, Eldoret.
- Landis, J.R. & Koch, G.G., 1977. The Measurement of Observer Agreement for Categorical Data. *Biometrics*, 33(1), p.159.
- Legg, C.J. & Nagy, L., 2006. Why most conservation monitoring is, but need not be, a waste of time. *Journal of Environmental Management*, 78(2), pp.194–199.
- O' Connel, A.F., Nichols, J.D. & Ullas Karanth, K., 2011. *Camera Traps in Animal Ecology: Methods and Analyses* A. F. O' Connel, J. D. Nichols, & K. Ullas Karanth, eds., Springer.
- Prettejohn, M., 2008. *On The Trail of the Mountain Bongo*. Swara.
- Ralls, K. 1978. *Tragelaphus eurycerus*. *Mammalian species* 111, 1 - 4.
- Reed, D.H., J.J. O'Grady, B.W. Brook, J.D. Ballou, and R. Frankham (2003). Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. *Biological Conservation* 113: 23-34.
- Reillo, P. 2002. Repatriation of Mountain Bongo to Kenya. *Antelope Specialist Group Gnusletter* 21 (2), 11 15.
- Ronald T.R.C. 1964. The bongo (*Taurotragus eurycerus*) - with notes on captive animals. *Der Zool.Garten*, Bd.28.
- Sanderson, E. W. (2006) How many animals do we want to save? The many ways of setting population target levels for conservation. *Bioscience* 56(11): 911-922
- Schaffer, M. (1987) Minimum viable populations: coping with uncertainty. In: M. Soulé (ed) *Viable populations for conservation*. Cambridge Univ. Press.
- Sillero-Zubiri C., 1987. Bongo: The ecology of spotted hyaena in Aberdare National Park.
- Stevenson, R.D. & Woods, W.A., 2006. Condition indices for conservation: New uses for evolving tools. *Integrative and Comparative Biology*, 46(6), pp.1169–1190.
- Traill, L.W., B.W. Brook, R. Frankham and C.J.A. Bradshaw (2010). Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143: 28-34.
- Veasey, J. S. 2008 Report to the European Endangered Species Programme for the Eastern Bongo on the Current Status
- Wilcox, (eds). *Conservation Biology: An Evolutionary-Ecological Perspective*. Sinauer, Sunderland, MA.
- Wright, D.J. et al., 2011. Variations in Eastern bongo (*Tragelaphus eurycerus isaaci*) feeding practices in UK zoological collections. *Zoo Biology*, 30(2), pp.149–164.





P.O. Box 40241 - 00100,
Nairobi Kenya
Tel: +254 (20) 2379407 / (408- 412)
Email: kws@kws.go.ke
Website: www.kws.go.ke