Strategic Planning for Ethiopian Wolf Conservation

Canid Specialist Group
IUCN/Species Survival Commission

Early morning greeting of Ethiopian wolves in the Bale Mountains National Park © A.L. Harrington.

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Produced at the strategic planning for
Ethiopian wolf conservation meeting
Lalibela, Ethiopia
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Preface

Large carnivores often find themselves at odds with peoples' interests, and as a result are threatened with extinction. The Ethiopian wolf or ky kebero could be the next such carnivore to lose its place on earth. It is now the rarest of all canids, with only 450 surviving in half a dozen mountains in Ethiopia. Furthermore, this species is the most endangered carnivore in Africa. What can be done to save this enigmatic icon of the Ethiopian highlands?

The Ethiopian wolf is protected by Ethiopian law, but this by itself cannot guarantee that the Afroalpine habitats where the wolves live are safe. With the main wolf populations found in the Bale Mountains National Park and Simien Mountains National Park, Ethiopian conservationists are well placed to ensure the survival of these magnificent animals. Other small populations in Arsi, Menz and Wollo are increasingly receiving formal protection offering a good prognosis for the future. Ultimately, it is the demand for arable land, pasture and firewood that keeps putting pressure on the Afroalpine habitats of Ethiopia, and this process is made more urgent by climate change. More immediately though, it is the domestic dogs that shepherds bring to the highlands that pose the most urgent threat to Ethiopian wolves. Dogs carry rabies and canine distemper, both lethal for their wild relatives, often causing widespread mortality among Ethiopian wolves.

Conservation actions must be built on sound knowledge, a fact all too often ignored by conservation organizations. For over two decades, Ethiopian and international scientists have devoted great effort to chronicling the life of Ethiopian wolves, helping us to understand the processes that threaten their survival. National park authorities and conservationists have worked hard to offer protection to the remaining wolf populations, while educating the highland people living side by side with wildlife as to the benefits of protecting Ethiopia's unique flora and fauna. With perseverance and dedication conservationists have sought to protect the wolves and their habitats from encroachment and disease.

The conservation strategy and National Action Plan (NAP) presented herewith, is the result of a meeting of stakeholders in Lalibela in February 2011, and is based on critical information and comprehensive knowledge about the Ethiopian wolf and its environment. Because of this, the plan is authoritative, realistic, and innovative, a solid base for providing the Ethiopian wolf with a future.

However, the conservation strategy represents more than just a blueprint for the survival of the Ethiopian wolf. Though this animal is a natural icon of the Ethiopian highlands, it is only one of many endemic species found there. The goal of the National Action Plan is to protect and manage a whole unique Afroalpine ecosystem, for the benefit of plants and animals, and the local peoples whose future depends upon the health of the land.

The Ethiopian government, the conservation community and the people living in and around Afroalpine habitats must now cooperate fully to implement this National Action Plan. The struggle to save the Ethiopian wolf is a long-term task, requiring constant vigilance, cooperation and dedication. This action plan represents an affirmation of the determination of the Ethiopian people that this iconic species will not vanish from our land.

Dr Kifle Argaw
Director General
Ethiopian Wildlife Conservation Authority

Acknowledgements

Many people contributed to the compilation of this strategic plan, and we are grateful to all of them for their input and comments. In particular, Jorgelina Marino, Anne-Marie Stewart, Chris Gordon and Claudio Sillero worked hard writing, reviewing and editing the various chapters. We are grateful to Kifle Argaw for writing the preface to this plan, to Simon Stuart for kindly agreeing to write the foreword, and to Teresa Fuertes for her tireless efforts in handling the layout and design of this plan.

This plan was inspired by the EWCA Ethiopian Large Carnivore Working Group and forms part of a series of action plans for the large carnivores of Ethiopia. Thank you to all members of the working group. We would like to extend our appreciation to Mark Stanley-Price, of the IUCN/SSC Species Conservation Planning Sub-Committee, who did an excellent job of facilitating the meeting and ensuring that we achieved our objectives within a limited timeframe. We are particularly grateful to the members of the IUCN/SSC Species Conservation Strategy Task Force for their excellent guidelines, which we followed during this planning process.

The strategic planning meeting was made possible through a generous donation from Saint Louis Zoo. We would also like to thank the Born Free Foundation, the Wildlife Conservation Network and the Frankfurt Zoological Society for their continuous support to protect Ethiopian wolves and the Afroalpine ecosystem.

List Of Abbreviations

ARD	Agriculture and Rural Development
BERSMP	Bale Eco-Region Sustainable Management Programme
BFF-ET	Born Free Foundation Ethiopia
BMNP	Bale Mountains National Park
BoA	Bureau of Agriculture
CCA	Community Conservation Area
CDV	Canine distemper virus
EPA	Environmental Protection Agency
EWCA	Ethiopian Wildlife Conservation Authority
EWCP	Ethiopian Wolf Conservation Programme
FVM	Faculty of Veterinary Medicine
FZS	Frankfurt Zoological Society
IBD	Institute of Biodiversity
IBREAM	Institute for Breeding Rare and Endangered African Mammals
IUCN	International Union for Conservation of Nature
MoARD	Ministry of Agriculture and Rural Development
NGO	Non-governmental organisation
NRM	Natural Resource Management
OFWE	Oromia Forest and Wildlife Enterprise
PA	Protected Area
WCN	Wildlife Conservation Network
WildCRU	Wildlife Conservation Research Unit

Foreword

The Strategic Plan for Ethiopian Wolf Conservation represents the latest stage in the conservation of Africa's rarest canid, the ky kebero or Ethiopian wolf *Canis simensis*, an Ethiopian Highlands flagship species. The origins of this important publication can be traced back to the late 1980s when Claudio Sillero first moved to Ethiopia to work on the wolves at the invitation of Chris Hillman, then a well-known figure in Ethiopian conservation. Since then, the Ethiopian Wolf Conservation Programme and the Ethiopian government have worked together with their conservation partners to build the programme, pioneering new research and field techniques, and gradually expanding the work beyond the Bale Mountains National Park to incorporate all seven extant populations. The Ethiopian wolf, listed as Endangered by the IUCN, numbers less than 450 individuals and is recognised as one of the world's most endangered carnivores. Teetering on the edge of extinction, it almost certainly would have succumbed to disease, hybridisation, and habitat loss were it not for the ongoing work of dedicated conservationists. I have never been fortunate enough to visit the Bale Mountains, or to see the Ethiopian wolf. But I am struck by the many photos I have seen of the animal – a strikingly beautiful species in a magnificent landscape. However, despite the successes of those working towards its conservation to date, there are growing threats that could not have been anticipated back in the 1980s. In particular, the human population, living by subsistence means, is increasing and moving higher up the mountains, encroaching ever further into Afroalpine habitat. These people do not have many alternatives to meet their essential needs, and already many highland endemics are being affected by unsustainable farming and harvesting activities. And increasing human populations bring with them a more immediate threat in the guise of their domestic dogs that transmit deadly diseases to the wolves. The future of the Ethiopian wolf, as with so many species, is going to depend on reconciling the needs of people and nature, and ensuring economic development and conservation do not undermine each other. The Strategic Plan for Ethiopian Wolf Conservation, and its associated National Action Plan, address these new challenges, and I am hopeful that it will achieve further success, not only for the Ethiopian wolf, but also for the surrounding human communities.

Dr Simon Stuart
Chair
IUCN Species Survival Commission

Executive Summary

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The Ethiopian wolf, *Canis simensis*, is not only the rarest canid in the world, but also holds the unenviable position of being Africa's most endangered carnivore. Found in only six isolated habitat fragments in the highlands of Ethiopia, the wolves have become victims of their own specialization. Feeding predominantly on high altitude rodents, and therefore relying heavily on intact Afroalpine habitats to support their rodent prey, Ethiopian wolves are increasingly under pressure from human expansion into their highland enclaves. Encroaching agriculture brings with it various other threats, such as habitat degradation through cattle and crop farming, diseases carried by domestic dogs, and the possibility of direct persecution in retribution for real or perceived livestock predation.

With less than 500 adult wolves surviving today, conservation actions to ensure the persistence of this species are crucial. The species is less common and has a more reduced range now than in the past. It is listed as Endangered on the IUCN Red List of Threatened Species. The largest population of wolves is found in the Bale Mountains, while elsewhere the wolves are found in significantly smaller, less robust populations subject to loss of genetic viability and extinction.

In 1997, the IUCN Canid Specialist Group compiled a detailed action plan outlining a strategy for the conservation and management of Ethiopian wolves. This plan called for improved management and expansion of protected areas, the control of domestic dog populations in wolf habitats, a greater focus on environmental education, and the need for further research into the remaining wolf populations. Now, 14 years later, it was felt the time was right to review the status of Ethiopian wolves, to evaluate current conservation measures, and to reassess priorities with regards to their management and future conservation.

The Strategic Planning Meeting for Ethiopian Wolf Conservation was held in Lalibela, Ethiopia, from the 23rd to the 25th of February 2011. The meeting was attended by 25 representatives from various national

and international conservation organisations, both governmental and non-governmental, as well as community spokespersons living within wolf range. The meeting started with a review of the action plan process - why it was necessary and what information the participants would be building on. This was followed by an overview of the Ethiopian wolf, its status, distribution, ecological requirements, and the threats it faces. Relatively in-depth and long-term data exists on the larger populations of Ethiopian wolves found in Bale, Arsi and Simien, although the most reliable data comes from the Bale Mountains in southern Ethiopia, where the Ethiopian Wolf Conservation Programme (EWCP) has been operating for the past 16 years. Participants were invited to give their feedback on the status review, providing additional information where it was missing, or advocating changes where they felt necessary.

The group discussions started with the drafting of a vision statement, followed by the development of targeted goals to work towards over the next 10 years. The participants then broke into groups to further refine the goals. A short presentation on the major threats facing the wolves was followed by further group work to develop a threat tree, essentially an exercise for analysing the various threats and constraints to Ethiopian wolf conservation. At the end of day one, the vision for Ethiopian wolf conservation had been drafted, and read as follows: "To secure viable and ecologically functioning Ethiopian wolf populations and habitats across their present distribution, to extend the species presence to suitable ranges, and to emphasise its role as a flagship for the conservation and sustainable use of the Afroalpine ecosystem and biodiversity, on which present and future generations of Ethiopians also depend."
It was felt that it was very necessary to not only secure current wolf populations, but to pursue the possibility of increasing the species' range to other suitable areas within Ethiopia, whilst ensuring the long-term conservation of the Afroalpine environment on which both the wolves and people depend.

With this vision in mind, six goals were agreed on by the participants:

1. All existing Ethiopian wolf populations secured, not at risk of immediate extinction, with genetic diversity maintained, and the number of wolf packs increased.

2. Ethiopian wolves actively managed as a metapopulation, including wherever possible the restoration of wolves to available habitat within their historical range.

3. Afroalpine habitats protected from further degradation, conserved, and restored.

4. Coexistence of wolves, people and their livestock fostered throughout the species' range.

5. All stakeholders, especially decision makers at the national, regional, and local levels, involved in, and committed to conserving wolves and their habitat.

6. Mechanisms developed to fairly share, across generations, the costs and benefits of wolf and Afroalpine conservation.

Day two of the workshop concentrated on the formulation of measurable objectives and their associated actions, which will be carried out over the next 10 years in order to achieve the six goals. Crucially, the actions that were listed under each objective specified their time line, the actors involved, and the body ultimately held accountable for ensuring their successful implementation and achievement.

Part One:
Ethiopian Wolf Status Review

Pack of Ethiopian wolves socializing in the early morning (©M. Harvey).

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1. Species description *What is the species?*

Common name	Ethiopian wolf, Abyssinian wolf, Simien fox, Simien jackal, ky kebero (Amharic), *jeedala fardaa* (Afan Oromo)
Scientific name	*Canis simensis* Rüppell, 1840
Order	*Carnivora* (Carnivores)
Family	*Canidae* (Canids)
Conservation status	IUCN Red List: Endangered B1ab(iii,v);C1+2a(i);D ver 3.1 (2011). Officially protected in Ethiopia
Occurrence in protected areas	Simien Mountains National Park, Bale Mountains National Park, Arsi Mountains Regional Park, Abuna Yoseph Community Conservation Area, Menz-Guassa Community Conservation Area, Borena Saiynt Regional Park, Aboi Gara Community Conservation Area
Global population	Fewer than 500 adults and subadults in six isolated populations
Morphology	Long legs and long muzzle; distinctive bright tawny rufous coat with black and white marks; mean mass ~16 kg
Habitat requirements	Very localized endemic species confined to Afroalpine grasslands and heathlands above 3,000m in Ethiopia
Diet and foraging behaviour	Solitary, diurnal foragers of small mammals of the high altitude Afroalpine grassland community
Social organization	Discrete and cohesive social packs with strong hierarchies; communal breeding and territorial defence

Taxonomy and genetics. Originally classified in a separate genus *Simenia* (Gray, 1868; Allen, 1939), the Ethiopian wolf is one of five Canis species in Africa (including the newly discovered African wolf), yet readily distinguishable from jackals (*C. aureus, C. mesomelas*, and *C. adustus*) by its larger size, relatively longer legs, distinctive reddish coat and white markings (Sillero-Zubiri & Gottelli, 1994). Although it is often called Simien fox or red fox, the Ethiopian wolf is not closely linked to the fox group (*Vulpes* - subfamily *Vulpinae*) (Clutton-Brock *et al.*, 1976), or to the side-striped jackal (*Canis adustus*) and South American foxes (*Pseudalopex* spp.) with which it was considered to show close affinity (Clutton-Brock *et al.*, 1976).

Phylogenetic analysis using mitochondrial DNA sequencing suggested that *C. simensis* is more closely related to the grey wolf (*C. lupus*) and the coyote (*C. latrans*) than to any African canid (Clutton-Brock *et al.*, 1976) and that the species may have evolved from a grey wolf-like ancestor crossing to northern Africa from Eurasia as recently as 100,000 years ago (Gottelli *et al.*, 1994), when Afroalpine habitats in Ethiopia covered vast extensions (Fig. 1). There are fossils of wolf-like canids from the late Pleistocene in Eurasia (Kurten, 1968), but unfortunately no fossil records exist for *C. simensis*. Microsatellite and mitochondrial DNA variability in *C. simensis* was small relative to other canid species (Gottelli *et al.*, 1994; Gottelli *et*

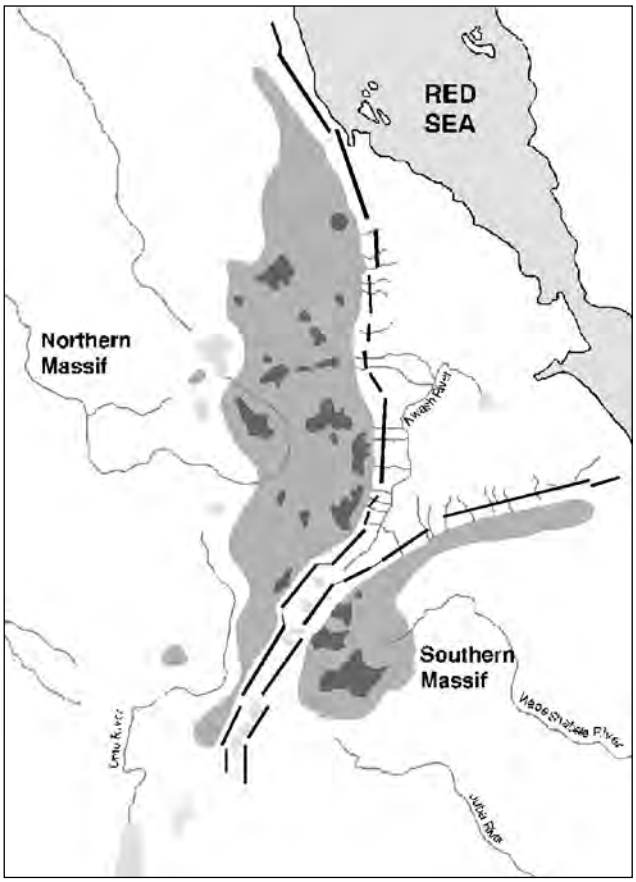


Figure 1. Probable range of Afroalpine habitat in the last glacial period (adapted from Kingdon, 1990). Dark grey: glaciated mountains, light grey: Afroalpine and subalpine habitats, broken line: rift walls.

al., 2004) suggesting small population sizes may have characterized its recent evolution. Coetzee (1977) recognized two subspecies: *C. s. simensis* north-west of the Rift Valley and *C. s. citernii* south-east of the Rift Valley on the bases of colouration and the shape of nasal bones, and later supported by differences in cranio-morphology (Dalton, 2001) but mtDNA analysis from a larger sample of individuals does not support the sub-species criteria of reciprocal monophyly of the northern and southern clades (Gottelli *et al.*, 2004).

Morphology.

Their legs are strikingly long and slender, seemingly suitable for coursing in open country. The muzzle is long, and the small, well-spaced teeth suggest morphological adaptation to feeding on rodents. The adult pelage is soft and short, of a distinctive bright tawny rufous colour with a dense whitish to pale ginger underfur. The coat is lighter in juveniles, and turns to yellowish in females during the breeding season. The throat, chest, a band around the ventral part of the neck, the underparts and inside of limbs are white, with the outline between the red coat and the white markings sharp and well defined. The ears are pointed and broad, their dorsal surface red fringed with long white hairs growing inward from the edge. The tail is a thick black brush with the proximal third white underneath. Male Ethiopian wolves are significantly larger than females: in Bale, adult males have a mean mass of 16.2 kg (14.2 - 19.3 kg) and females 12.8 kg (11.2 - 14.15 kg) (Sillero-Zubiri & Gottelli, 1994).

Diet and foraging behaviour.

Ethiopian wolves live in close-knit territorial packs but they forage and feed alone on small prey, contradicting the general trend in carnivores for grouping and cooperative hunting. Wolves are most active during the day with peaks of foraging activity synchronized with the activity of rodents above the ground (Sillero-Zubiri & Gottelli, 1995a; Sillero-Zubiri *et al.*, 1995a, 1995b).

In the Bale Mountains, the wolves feed almost exclusively upon diurnal small mammals of the high altitude Afroalpine grassland community, mainly giant molerats (*Tachyoryctes macrocephalus*), a rare root-rat restricted to the Bale Mountains, and two species of Murinae rats: *Arvicanthis blicki* (grass rat) and *Lophuromys melanonyx* (Sillero-Zubiri & Gottelli, 1995a; Sillero-Zubiri *et al.*, 1995a). In locations where the giant molerat, the largest and preferred prey is absent, this is replaced in the diet by the smaller common molerat, *T. splendens* (Ashenafi *et al.*, 2005), and where this is rare, wolves depend entirely on small rats (particularly *Otomys typus* and *A. abyssinicus*), including some nocturnal species (Marino *et al.*, 2010). Occasionally small packs have been seen chasing and killing young antelopes, lambs, and hares in Bale. Wolves will take carrion, but dogs and jackals tend to monopolize carcasses (Sillero-Zubiri & Gottelli, 1995a). The potential effects of competition between domestic dogs and Ethiopian wolves were studied in the Web Valley (Atickem *et al.*, 2010). Here the diet of dogs was dominated by barley husks, human faeces and animal carcasses, and rodents contributed only a very small proportion. As Ethiopian wolves feed almost exclusively on rodents year round, no significant exploitative competition was found.

Spatial and social organization.

Ethiopian wolves live in discrete and cohesive social packs that communally share and defend an exclusive territory. Groups are formed by delayed dispersal of young males and a few females which, apart from those in the dominant position, are largely reproductively suppressed (Sillero-Zubiri & Gottelli, 1995b; Sillero-Zubiri *et al.*, 1996). Dispersal movements are tightly constrained by the scarcity of suitable unoccupied habitat. Family groups can contain up to 20 wolves older than one year, but most commonly around six (average over a four year period), with a communal territory of over 6 km^2 on average. In an area with lower prey productivity, however, wolves live as mated pairs, sometimes accompanied by an offspring, and defend larger territories (average 13.4 km^2). Home ranges overlap extensively between members of the same pack, and the territories of neighbouring packs are largely discrete, forming a mosaic of packs occupying all available habitat. When not affected by epizootics, these territories are stable in time, but packs would expand whenever the opportunity arises, after the disappearance of a pack or a significant demographic change (Sillero-Zubiri & Macdonald, 1998; Marino *et al.*, 2006). The size of territories, and the abundance of rodents within them, correlated with the size of the pack (Marino *et al.*, submitted-a) and the survival of pups at a certain age stage (Tallents *et al.*, 2011, submitted).

Ethiopian wolves congregate for greetings and border patrols at dawn, noon and evenings, and may rest together at night. Wolves sleep in the open. Occasionally, they seek shelter from the rain under overhanging rocks and behind boulders (Sillero-Zubiri & Gottelli, 1994). They do not use dens to rest at night, and during the breeding season only pups and nursing females use the den.

During border patrols, the whole pack scent-marks regularly and aggressive interactions with neighbouring packs are common in Bale, and highly vocal, ending with the smaller group fleeing from the larger (Sillero-Zubiri, 1994; Sillero-Zubiri & Macdonald, 1998). Hierarchies among pack members are well established with frequent displays of dominance and subordination. Breeding females typically are replaced after death by a resident daughter, resulting in a high potential for inbreeding, to some extent circumvented by extra-pack copulations and multiple-paternity (Gottelli et al., 1994; Sillero-Zubiri *et al.*, 1996; Randall *et al.*, 2007).

(© A.L. Harrington)

Giant molerat and grass rat, two Ethiopian endemics.

(© M. Harvey)

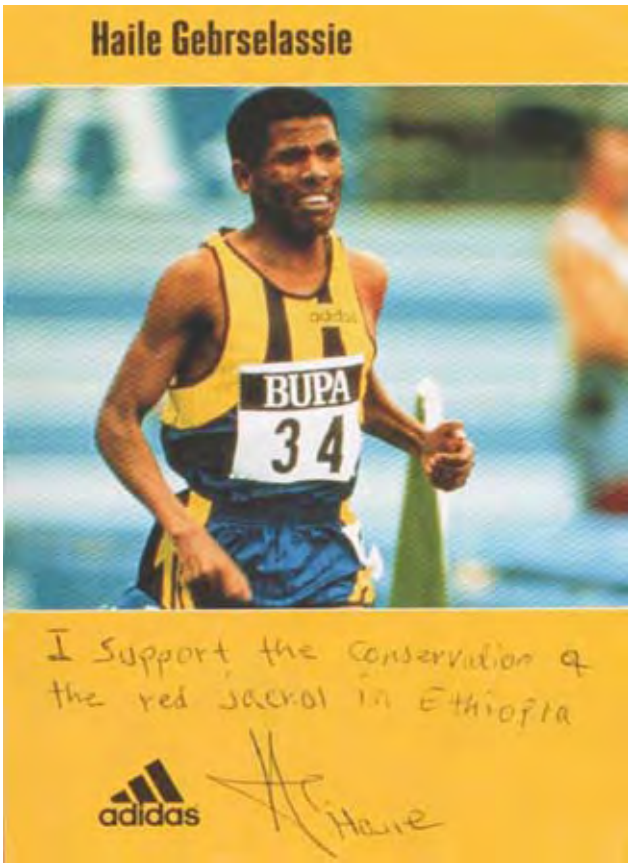
Reproduction and denning behaviour.

In the Bale Mountains, most matings occur between August and November, when the receptive period of females is locally synchronized to less than two weeks (Sillero-Zubiri *et al.*, 1998). Courtship primarily involves the dominant male accompanying the dominant female constantly. The female discourages attempts from all but the pack's dominant male, but she is receptive to any visiting male from neighbouring packs (Sillero-Zubiri *et al.*, 1996). Gestation lasts from 60-62 days and the dominant female of each pack may give birth once a year between October and December (Sillero-Zubiri *et al.*, 1996). Up to six pups may emerge from the den after three weeks. All pack members guard the den, chase potential predators, and regurgitate or carry rodent prey to feed the pups.

Subordinate females may assist the dominant female in suckling the pups (Sillero-Zubiri, 1994; Sillero-Zubiri *et al,.* 2004, 2011). By week 10, the pups subsist almost entirely on solid foods supplied by helpers, and they stop receiving food from adults by the time they are one year old. Full adult appearance is attained at two years and both sexes become sexually mature during their second year.

2. Values *Why save the species?*

The Ethiopian wolf is of global importance to both the conservation and scientific community, because of its threatened status and its recognition as a unique species. The Ethiopian wolf is part of an array of unique plants and animals in the high elevations in Ethiopia, evolving under intense selective pressures in mountain environments surrounded by deserts (Kingdon, 1990). This highland biodiversity is an extremely important resource of the Afroalpine, but not the only one. Other resources include water catchments, places of historical and cultural significance, grazing pastures and agricultural land. For these reasons, the Ethiopian wolf plays an important role as a flagship species, as conservation of the species translates into the protection and maintenance of habitats and ecological processes, and their associated benefits and products. As the top predators of the Afroalpine ecosystem, they have an important role in ecosystem functionality, including interactions with their rodent prey and cascade effects on the Afroalpine vegetation and the quality of soils, via the ecosystem engineering role of the fossorial rodents.



The world famous runner supports the conservation of Ethiopian wolves.

There is little evidence of consumptive use of Ethiopian wolves or exploitation for fur or other purposes, which may explain why the Ethiopian wolf has not played a major role in Ethiopian folklore. People in possession of skins were recorded by EWCP on only two occasions (Mt. Guna and Simien, EWCP unpublished data). Some indication of the interest that wolves may have held for indigenous people, however, is to be found in their local names. For instance, the name "jeedala fardaa" given by the Oromo people means "horse's jackal", referring to the reported habit of wolves following mares and cows about to deliver and eating the afterbirth. At present, local communities living within and around wolf range do recognise that the species is special, as a result of its beauty and endemic status, and do attach a value to the wolves in this respect. The wolf and other endemic species are also used as the country's symbols by the government, with the Ethiopian wolf illustrating two post stamp series and numerous posters promoting Ethiopia's wildlife.

Last but not least, the tourism value of a rare endemic species such as the Ethiopian wolf should not be

underestimated. Wildlife tourism in Ethiopia is gaining more exposure and interest, and the development of this sector offers numerous opportunities for both tour operators and local communities. The mountain habitat that plays host to the Ethiopian wolf contains some of the most spectacular scenery to be found in the country, as well as harbouring various other endemic mammal and bird species of interest to tourists.

In the Bale Mountains National Park, over 40% of the 1,500 tourists visiting the Park annually state that they have come specifically to see wildlife, while other tourists are interested in trekking activities (FZS internal report, 2011). Tourism in Bale is on the increase, contributing to community associations of guides, horse lenders and porters, and to local businesses, but its potential remains unfulfilled (BMNP, 2009).

Visitors to the Simien Mountains National Park have increased from 655 in 1999 to about 7,000 in 2007 (Martin, 2008), and a newly established private lodge reported an annual 23% increment in users from 2005 to 2010, mainly attracted by the endemic wildlife species such as the endangered walia ibex (*Capra walie*), Ethiopian wolf and gelada (*Theropithecus gelada*) (Lodge Manager, pers. comm.).

Ethiopian wolves are also potentially important for tourism outside traditional protected areas, such as in Guassa-Menz in North Shoa and Abuna Yoseph in North Wollo. In Guassa-Menz, a community-based initiative is already attracting visitors and it provides locals with a tangible income and an incentive to conserve this Afroalpine area. According to the record book of the Guassa Community Conservation Association, the total number of visitors was 23 in 2009 and 37 in 2010 (but the actual number was higher) (Zelealem Tefera, pers. comm.). Community-based tourism is also growing in Abuna Yoseph, near Lalibela, providing tourists with the opportunity to combine the historic route with mountain trekking and sightings of endemic wildlife including Ethiopian wolves and geladababoons.

Tourist Camp in Gich, Simien Mountains National Park (© J. Marino).

3. Historical account *How did the current situation arise?*

Drawing of an Ethiopian wolf, by Louis Agassiz Fuertes (1874 – 1927).

The Ethiopian wolf has been recognized by Ethiopian people for a very long time. The earliest uncovered reference to the species dates to the 13th century or earlier, referring to *"Ethiopicis lupis"* as a docile carnivore that never attacks men (Barber, 1993). The Ethiopian wolf has always been rare and already in 1938 it was listed as requiring protection (Harper, 1945). The species has full official protection under Ethiopia's Wildlife Conservation Regulations of 1974 (Schedule VI); killing a wolf carries a sentence of up to two years in prison. Yet little was known about the biology of Ethiopian wolves until the 1980s, when the Bale Mountains Research Project was set up with support from the USA, which publicized the wolf's plight, started a regular monitoring programme, and supported the detailed four-year field study that followed (Sillero-Zubiri, 1994).

Human encroachment, triggered by political instability, started to affect wolf habitats in the Bale Mountains National Park, but it was a severe rabies epidemic that ultimately revealed to the world the critical status of the species. In the early 1990s, a combination of rabies and shooting (triggered by political unrest), decimated most of the study packs in the Web Valley and Sanetti Plateau populations, and mainly as a result of this drastic decline, the species was re-classified by the IUCN Red List from Endangered (Ginsberg & Macdonald, 1990) to Critically Endangered in 1994 (Sillero-Zubiri & Marino, 2008). This new status reflected the extremely high risk of the species going extinct in the wild. In 1994, the IUCN/SSC Canid Specialist Group produced the first action plan for the Ethiopian wolf (Sillero-Zubiri & Macdonald, 1997), with a detailed strategy for the conservation and management of remaining wolf populations. This plan advocated for immediate action on three fronts – education, wolf population monitoring, and rabies control in domestic dogs – to conserve the Afroalpine ecosystem and its top predator. As a result, the Ethiopian Wolf Conservation Programme (EWCP) was established in Bale in 1995, by Oxford University in partnership with Ethiopian Wildlife Conservation Authority (EWCA, then EWCO).

By then, another important wolf population became well-known to science and to the conservation world, thanks to a research and conservation project in Guassa-Menz in the Central Highlands, in land traditionally managed by local communities using the natural resources (the 'kero' system) (Ashenafi, 2001; Ashenafi *et al.*, 2005). Otherwise, there was only sparse and mostly anecdotal information on other wolf populations. The Ethiopian wolf had been reported in the Simien Mountains since it was first described in 1835 (Nievergelt *et al.*,

1998), but scattered and irregular sightings suggested declining numbers (Sillero-Zubiri & Macdonald, 1997). Reports from the Gojjam plateau were dated in the early century (Powell-Cotton, 1902; Maydon, 1932). South of the Rift Valley, wolves have been recorded in the Arsi Mountains since the turn of the century, and, more recently (1959), in the Bale Mountains (Hillman, 1986). Reports of small populations in North Sidamo (Haltenorth & Diller, 1980) may be an error. There is no evidence that the Ethiopian wolf ever occurred in Eritrea (Coetzee, 1977). In the late 1990s, conditions for expeditions to Northern Ethiopia improved and all high mountains were systematically surveyed and the status of wolf populations re-assessed (Marino, 2000; Ash, 2000; Marino, 2003). These surveys revealed a local extinction in Mt. Choke, Gojjam, but also small wolf populations in every sizeable Afroalpine relict across the northern highlands, where human pressure is acute and agriculture is well developed within the Afroalpine zone suitable for wolves. This new vision stressed the importance of the Bale Mountains populations for the long-term persistence of the species, but also the need to protect other extant populations. In 1999, the EWCP and the Ethiopian Wildlife Conservation Organisation organized a Population and Habitat Viability Analysis workshop in Bale (Sillero-Zubiri *et al.*, 2000). In 2000, the EWCP expanded to the northern highlands, widening the use of the Ethiopian wolf as a flagship species for the conservation of Ethiopia's unique Afroalpine ecosystem.

By that time, ten years after the rabies epizootics, the Bale populations affected by disease had recovered fully to pre-epizootic levels, showing demographic resilience in the apparent absence of further epizootics (Marino *et al.*, 2006). When the Red List status was reviewed in 2004, the species was downlisted to Endangered, following the IUCN's criteria based on demographic variables and population trends (i.e. < 250 mature individuals in the population, continuing decline in population size, and < 250 mature individuals in each subpopulation) (Sillero-Zubiri & Marino, 2008). Clearly, the Ethiopian wolf is more restricted now than in the past, and with less than 500 adult individuals surviving, this distinctive carnivore remains the rarest canid in the world and the most endangered African carnivore.

4. Current distribution, demography and genetics

What is the current status of the species?

Ethiopian wolf in the Simien Mountains, northernmost extreme of its range (© J. Marino).

Current distribution. Ethiopian wolves are currently confined to mountain ranges of the Ethiopian highlands at elevations between 3,000 and 4,500m (Gottelli & Sillero-Zubiri, 1992) (Fig. 2). In the northern highlands, wolves are restricted to land above 3,500–3,800m by increasing agricultural pressure (Yalden *et al.*, 1980; Marino, 2003). These remaining wolf habitats can be grouped into geographical entities or *Afroalpine Units* which, by definition, are separated by distances larger than the potential dispersal of individual wolves, known to be up to 20km from previous records (Sillero-Zubiri, 1995b; Zelealem Tefera, pers. comm.; Zegeye Kibrit, pers. comm.). It is reasonable to assume that dispersal of individuals between *Afroalpine Units* is not occurring at a substantial rate, or may not have been occurring at all. Therefore, each unit effectively contains an isolated population.

According to this definition, there are six extant populations of Ethiopian wolves. North of the Rift Valley, wolves occur in the Simien Mountains and Mount Guna in Gondar, in the North Wollo and South Wollo highlands, and in Guassa-Menz in North Shoa. Wolves are recently extinct in Gosh Meda (North Shoa) and Mt Guna (Gondar), and have been absent from Mt. Choke (Gojjam) for several decades (last reports in early this century). South-east of the Rift Valley, there are populations in the Arsi Mountains, and in the Bale Mountains, including the western range of Somkaru-Korduro (Fig. 2).

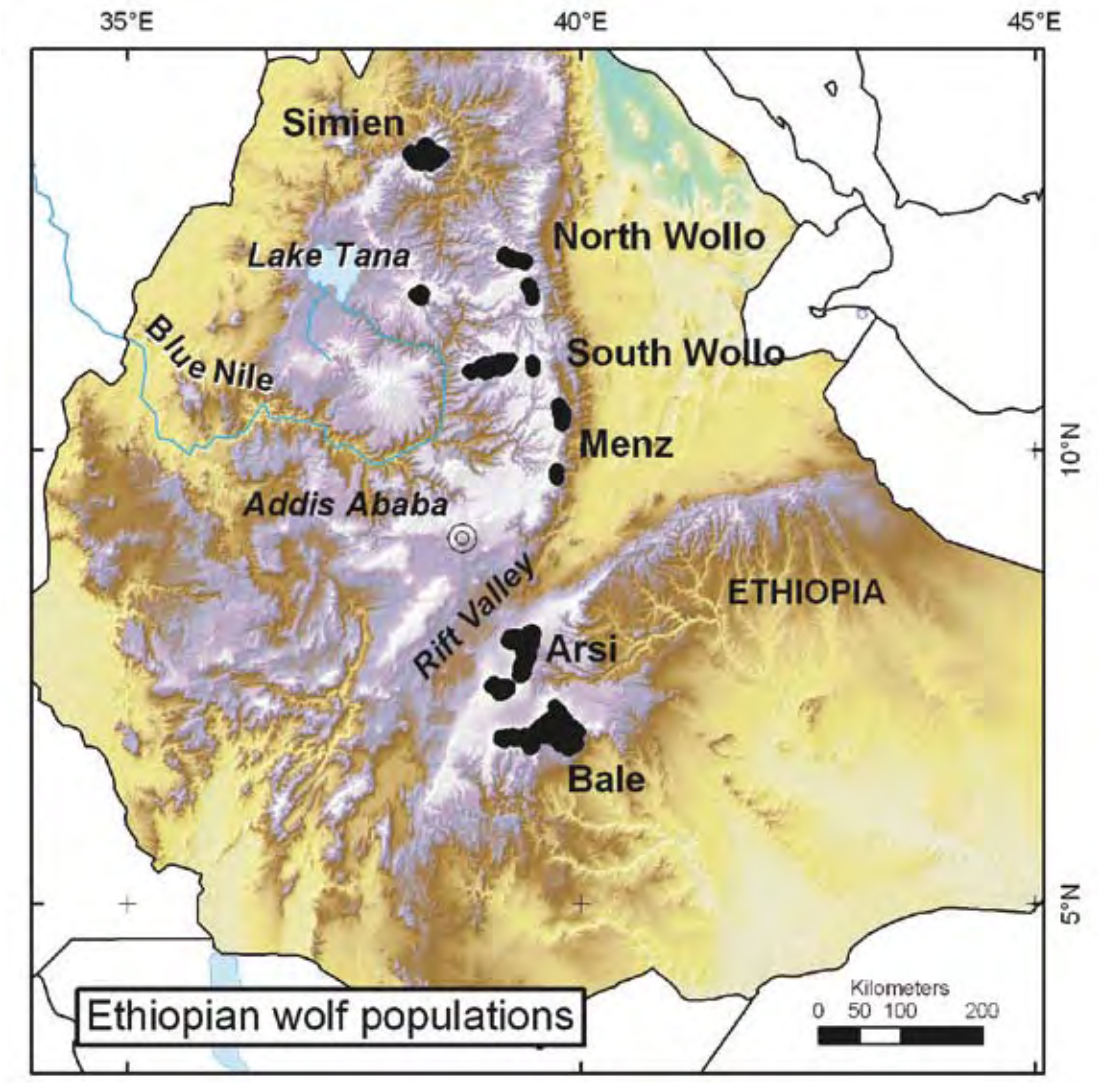


Figure 2. Location of the seven extant Ethiopian wolf populations (adapted from Marino, 2003a). Afroalpine ranges indicated in black.

Box 1. More Afroalpine habitats are now protected in Ethiopia

• In 2006, the *Simien Mountains National Park* was extended to include the reserves of Mesareriya and Lemalino, and in 2007, it incorporated the Silki Yared and Ras Dejen mountains, with linking corridors. In 1996, the park had been included on the List of World Heritage sites in Danger (whc.unesco.org/en/danger), due to heavy settlement by farmers, declining numbers of walia ibex and road construction. When the site's management was transferred to the Amhara region in 1997, a Park rehabilitation process ensued, with support from the Austrian Development Corporation and the World Heritage Committee, when local communities were consulted about resettlement of farmers, excision of villages and extension of the Park.

• In 2010, the Denkoro Forest Reserve in the South Wollo Zone was declared Borena Saiynt Regional Park by the Amhara Regional Authorities, largely thanks to the sterling efforts of the Frankfurt Zoological Society (FZS) and EWCP, who had maintained a presence in the area since the late 1990s. The process involved translocation of people residing or farming within the park boundary, and a community-based tourism initiative is now emerging.

• In 2011, the Oromia Forest and Wildlife Enterprise created the *Arsi Mountains Regional Park*, to protect this highland ecosystem and the associated forests in adjacent lowlands.

• Since 2000, the *Menz-Guassa Community Conservation Area* in North Shoa Zone (Menz-Gera Mider Woreda) has protected over 80 km^2 of Afroalpine habitat, under the management of the Menz-Guassa Conservation Council elected from among the users' community. The Guassa area had been under local community management for centuries, but with the decline of indigenous institutions during the 1974 socialist revolution, it became an open access resource. The Regional Bureau of Culture, Tourism and Parks is now developing legislation to recognise and gazette what will become the first community conservation area in the country. At the moment, a community-based scouting, monitoring and tourism initiative is working successfully. EWCP and FZS played a major role together with the local community and local administration in bringing back this conservation initiatwive.

• In North Wollo the Aboi Gara range is protected by local communities and Abuna Yoseph is de facto a community-managed conservation area since 2005. Concentrated effort is ongoing to legalize it and to demarcate the boundaries, with the participation of the user community, local administration and regional Bureau. The Abuna Yoseph range has been an open access resource for the community living around it with little degree of protection. EWCP and FZS have been supporting these initiatives and have maintained a presence in the area since the 1990s.

Over the last five decades, Ethiopian wolves have been protected in two national parks, currently managed by the Ethiopian Wildlife Conservation Authority (EWCA): the *Simien Mountains National Park (SMNP)* in the Amhara National Regional State, created in 1969 and inscribed on the World Heritage List in 1978, and the *Bale Mountains National Park (BMNP)* in Oromia National Regional State, created in 1970. More recently, with the extension and creation of new protected areas and community-based conservation initiatives (Box 1), the amount of suitable wolf habitat protected increased from 40% in 2000 to 87% in 2011.

Suitable range and surveys. The area currently occupied by Ethiopian wolves is a fraction of the habitat potentially suitable for the species, whether this is measured as the land above the tree-line, of which 60% has been converted to agriculture (Table 1) or the area with climatic conditions similar to those where the species is found at present (Fig. 3). Genetic markers also indicate a process of fragmentation and that the species was more numerous in the past (Gottelli *et al.*, 2004). Figure 3 displays information from extant and extinct populations over a map of the habitat predicted as climatically suitable for the Ethiopian wolf, using niche-modelling approaches (Marino *et al.,* unpublished). The species was known to occur in Mt. Choke (Gojjam) in the past, but there are no historical or current records from other highlands with seemingly suitable climate at relatively lower elevations, such as the highlands of Tigray in the north, the mountains north of the Rift Valley in Southern Shoa, or the Ahmar Mountains to the east, in the Hararge region (Sillero-Zubiri & Macdonald, 1997).

Afroalpine unit	Potential wolf habitat km²	Suitable wolf habitat remaining			
		km²	%	spatial configuration	km² protected
Simien Mountains	960	273	28	patches + corridors	200 (Simien Mountains National Park)
Mt Guna	210	51	24	isolated patch	
Mt Choke	500	134	27	isolated patch	
North Wollo	1,150	140	12	patches + corridors	
South Wollo	1,220	243	20	patches	20 (Borena Saiynt National Park)
Guassa-Menz	124	112	90	isolated patch	80 (Guassa Community Conservation
Gosh Meda	90	20	22	isolated patch	
Arsi Mountains	1,000	870	87	mainland-island	1,200 (Arsi Mountains Regional Park)
Bale Mountains	1990	1,141	57	mainland-island	1,100 (Bale Mountains National Park)
Total	**7220**	**2,984km² left (41%)**		**8 major isolated fragments**	**2,600km² protected (87%)**

Table 1. Distribution and extent of suitable wolf habitat in Ethiopia (adapted from Marino, 2003). The potential wolf habitat is defined as the land above 3,200m, broadly corresponding to the tree-line level. The suitable habitat still remaining was derived from habitats maps of Bale and Guassa-Menz (Sillero-Zubiri et al., 2000) and from field maps built up during extensive surveys between 1988 and 2000.

With between 250-300 wolves, the population in the Bale Mountains is by far the largest, and also the best known. For example, demographic data from two local populations in Bale go back to the early 1980s. Other wolf populations have been visited at least annually since 2000, and the wolf populations in Guassa Menz and Simien Mountains have been more intensively surveyed. Surveys across populations use standardized methodologies to monitor wolves and wolf packs, to assess Afroalpine habitats, wildlife and livestock abundance, and local people's attitudes. A status summary is presented for each population in Appendix I: *Ethiopian wolf populations: status summary.*

Wolf populations.

In the Bale Mountains, where more than half of the global population exists, Ethiopian wolves are present at densities unusually high for a social carnivore of its size. The highest densities, reaching 1.0–1.2 adults and subadults/km², are found in areas with short Afroalpine herbaceous communities, down to 0.2/km² in *Helichrysum* heaths, and possibly 0.1/km² in marginal habitats such as the ericaceous moorlands and barren peaks (Sillero-Zubiri *et al.,* 1995a). Local wolf densities in Bale correlate closely with the distribution and abundance of the main rodent prey, which is in turn highest in open areas with short vegetation and relatively deep soils (Sillero-Zubiri *et al.*, 1995a; Sillero-Zubiri *et al.*, 1995b; Tallents, 2007; Marino, submitted-a) (Fig.4). Such high productivity and concentration of rodents has not been found in any other Afroalpine range. A study of rodents in Guassa-Menz found similar associations between wolves, rodents and vegetation formations, but lower rodent and wolf abundances (estimated at 0.2 wolves/km² from transect counts) (Ashenafi, 2001). A rough indication of relative wolf abundance (in the form of wolves sighted per kilometre of survey route covered) indicated even lower densities in other northern populations (Marino, 2003).

On the basis of this close association between availability, and quality, of Afroalpine habitats and the abundance of wolves, the size of all extant wolf populations was estimated in 2000 using the newly available field data (Table 2). The expanding database of Ethiopian wolf sightings continues to show that wolves tend to use all Afroalpine habitats available in each Afroalpine range, as observed in Bale. With the exception of Bale and possibly Arsi, all extant populations are very

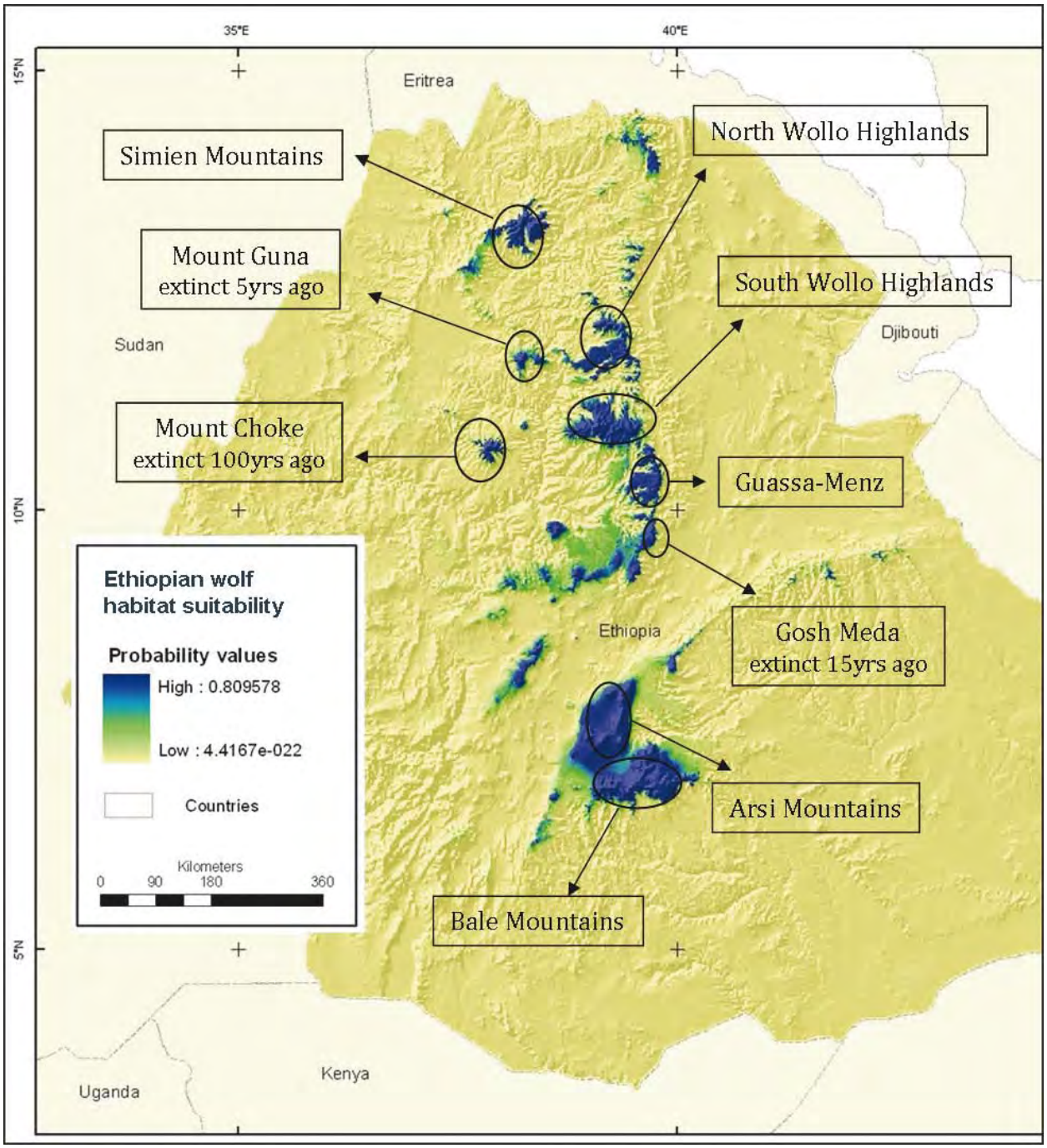


Figure 3. Ethiopian wolf populations over a map depicting the probability of habitats climatically suitable for Ethiopian wolves, derived from wolf sightings and global climatic databases using a niche modelling approach (Marino, unpublished).

small, estimated to contain fewer than 50 individuals and some fewer than 25 (more about small populations in the Threats section). Later on, these estimates proved to be within the range of estimates derived from closer observations of wolf packs in Simien (EWCP unpublished data) and from various methods used in the Guassa-Menz population, including genetic fingerprinting (Asmyhr, 2008), a method that identified 23 individuals, and line transect methods that estimated 21±5 individuals, compared with the 17-23 wolves estimated from habitat available (Table 2). The exception is the estimation for Arsi, where the method appears to overestimate the number of wolves in this Afroalpine range, probably because the extensive Erica moorlands do not sustain wolves at the density expected from the Bale studies.

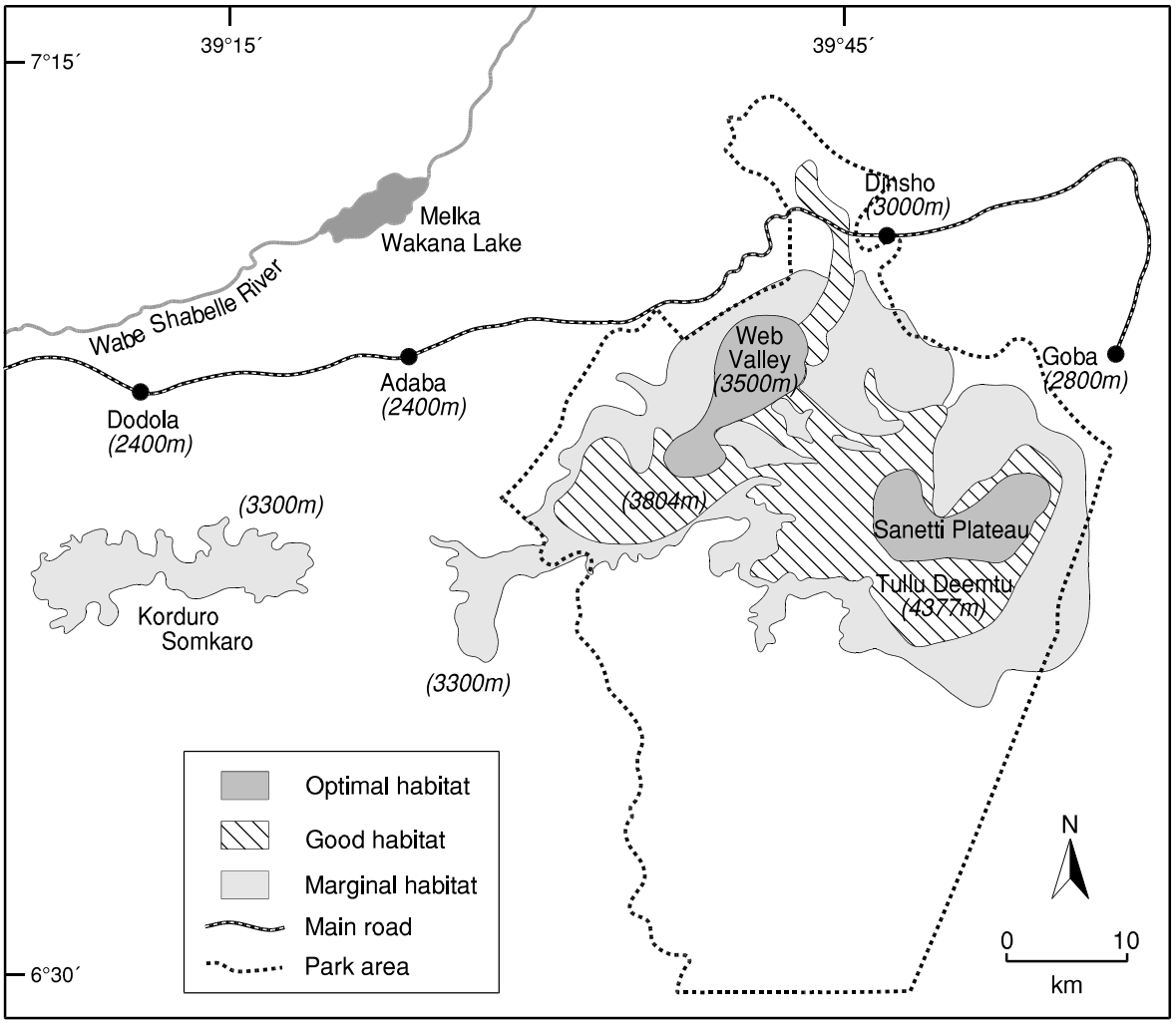


Figure 4. Map of the Bale Mountains National Park. Different Afroalpine habitats, and concurrent value for Ethiopian wolves are indicated (from Sillero-Zubiri & Macdonald, 1997).

Population trends and demography.

The main source of information on population demography and dynamics is the long-term monitoring of wolves in the Bale Mountains. Indirect estimates derived from counts of wolves, livestock and domestic dogs along roads have been useful to detect trends in local abundances of wolves and threats (Marino *et al.*, 2006; Stephens *et al.*, 2001; Vial *et al.*, 2010) (Box 2). Moreover, observations of focal packs in two optimal wolf areas (Web Valley at 3,500m and Central Sanetti (ca. 4,000m) permitted studies of the fall and rise of populations affected by rabies epizootics in the early 1990s, and assessments of the contributions of various factors to population change (Marino *et al.*, 2006, submitted-b) (Box 3). These populations recovered from drastic declines in the early 90s, but rabies struck again in Bale in October 2003 (Randall *et al.*, 2006) and again in 2008-09 (Gordon *et al.*, 2009; Johnson *et al.*, 2010).

The long-term studies of wolves in Bale have important implications for the protection and management of Ethiopian wolf populations. Firstly, the generalization that population growth will be most sensitive to changes in the survivorship of older individuals has been a useful guide for conservation and management of long-lived species. This rule of thumb however, should not be pursued to the exclusion of other options that might be practicable and offer rapid routes to slowing down an Ethiopian wolf population decline: for example, protecting dens while also working to reduce adult mortality from diseases or retaliatory

Afroalpine unit	Area of suitable habitat		Population estimate
	good quality km²	marginal km²	
Simien Mountains	132	142	52-75
Mt Guna	22	29	extinct
Mt Choke	46	88	extinct
North Wollo	46	94	19-23
South Wollo	21	122	16-19
Guassa-Menz	59	53	23
Gosh Meda	8	13	extinct
Arsi Mountains	144	646	54
Bale Mountains	-	-	~ 250
Estimated total population			**400-450**

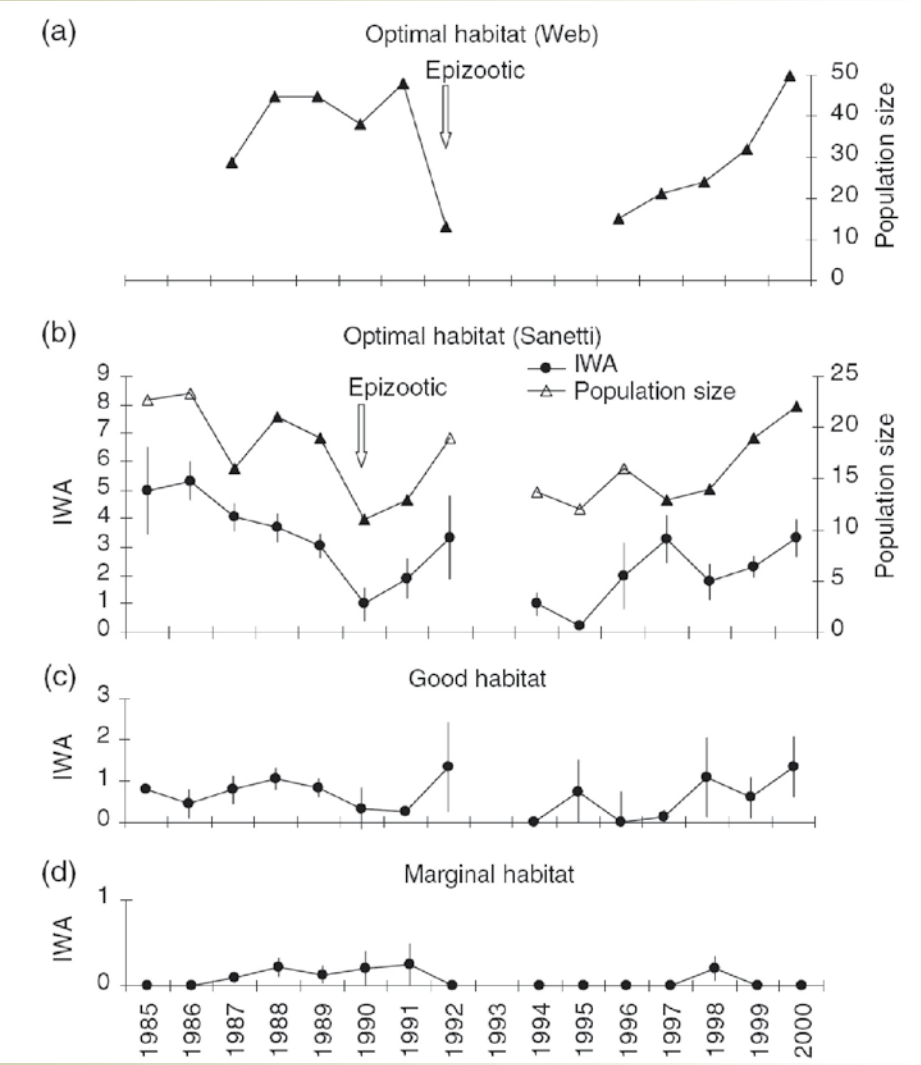
Table 2. Population estimates from observations and extrapolations of wolf densities to the remaining Afroalpine habitat (adapted from Marino, 2003). The categories were based on known associations between vegetation types and wolf density in the Bale Mountains: marginal habitat (0.1 wolves/km²) and good habitat (0.2 - 0.3 wolves/km²) (Gottelli & Sillero-Zubiri, 1992). The density values used for the extrapolations were the lower values associated the each habitat category in Bale, so that estimates were conservative.

killings. Secondly, the results also indicate that, within the limits of compensatory mortality, 'surplus' adults from saturated populations could be used for translocations or reintroductions. In the case of such interventions, the data also showed that small packs with primiparous females can successfully establish a new group in a new territory (unlike some other cooperative breeders such as African wild dogs *Lycaon pictus*; Courchamp & Macdonald, 2001), but also that social cohesion can retard population recovery or the colonization of an empty range, by limiting fecundity to fewer breeding units.

Population genetics. A study of mtDNA data across extant populations (Gottelli *et al.*, 2004) revealed a strong genetic structure and the distribution of haplotypes reflected the geographical split among three mountain blocks: (1) Arsi/Bale, south of the Rift Valley, (2) Wollo/NE Shoa, and (3) Simien/Mt. Guna. Some genetic differentiation is expected, even between nearby populations, in a species with such strict specialization to the Afroalpine highlands and with no suitable habitat to act as corridors for dispersals. The Simien Mountains population had the highest number of unique alleles, in accordance with biogeographical reconstructions showing that this population has been isolated for the longest period (Gottelli *et al.*, 2004). At present, there is no evidence of inbreeding depression or reduced fitness, but the extremely small number of breeding units, particularly in the smaller populations, does raise concerns.

Box 2. Trends in wolf population and threats in the Bale Mountains (Marino *et al.*, 2006)

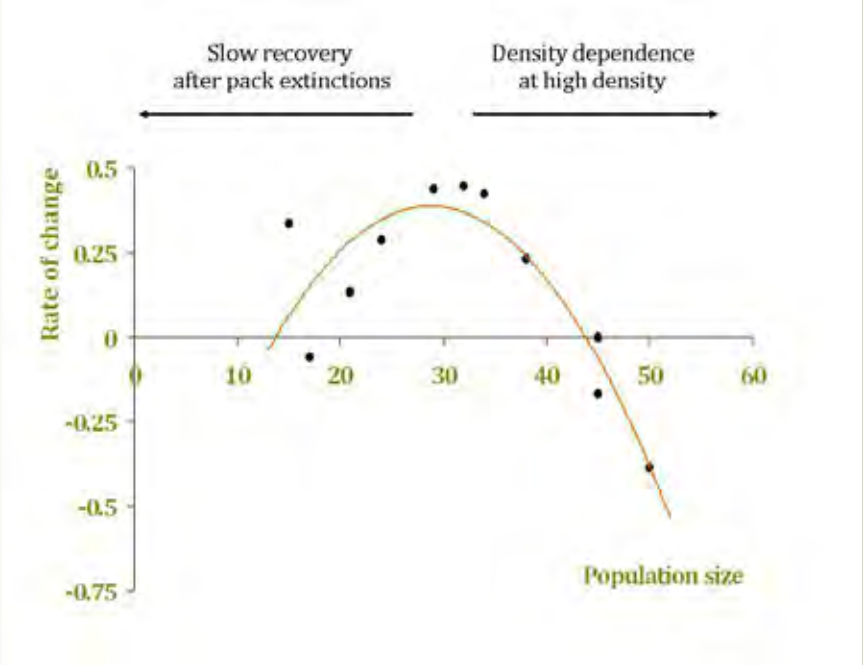
Time series of wolf abundance in the Bale Mountains from total counts (y=population size) and road transect counts (y= IWA : index of wolf abundance; error bars: standard deviation).



- **Populations depleted by epizootics in optimal habitat (a and b) can recover, but the recovery may be slow.**
- **Wolves in a less productive habitat (c) existed at lower densities, as expected by the lower abundance of prey, with slight fluctuations and no overall trend.**
- **In marginal habitat (d), a peripheral area remained unoccupied after the extinction of the resident pack in the early 1990s.**
- **Trends in local wolf abundances were unrelated to trends in the abundance of people, livestock or dogs within the Afroalpine habitat, even when these were found to be on the increase (data not shown).**
- **In Bale Mountains, rabies emerged as the main cause of population decline in high density populations.**

Box 3. Population dynamics and demography of Ethiopian wolves
(Marino *et al.*, 2006 and submitted-b)

Relationship between the rate of population increase and the increasing size of the Web Valley population. The line fitted is a second-order regression. Adapted from Marino (2006), using a longer time series.



- This data is taken from 15 years of wolf monitoring in Web Valley and Central Sanetti, including 16 popula tion/years and 64 pack/years across 14 packs.
- Population recovery from epizootics was initially slow. This was because wolves tended to remain in their natal group after the extinction of neighbouring packs and it took time for new pack to form. The factors that favoured recovery were larger litters, fewer females dispersing, and the acceptance of immigrants from outside the local population. As wolf numbers increa sed, populations attained high growth rates.
- Populations showed density dependent growth at high density. This is typical of most carnivore populations when levels of interference and/or depletion increase, and among Ethiopian wolves, it affectsmore strongly pups in their first year of life, when they become inde pendent and are no longer fed by other pack members (Sillero-Zubiri et al., 1996, Sillero-Zubiri *et al.*, 2004). The survival of wolves of two years or older was always high (Ethiopian wolves can live for up to 13 years).
- Like in other long-lived species, adult survivorship contributed the greatest to population growth, fo llowed by survival in the first year of life. Fecundity was less important and determined by the number of packs present in the population.
- Variations in rainfall, an indicator of the plant biomass available to the rodent prey, did not affect population growth. Food fluctuations and predation can be largely dismissed as factors regulating wolf numbers in Bale, because Ethiopian wolves lacks natural enemies and the rodent prey is stable, rich and rapidly renewable (Sillero-Zubiri *et al.*, 1995a, 1995b).

5. Habitat and resource assessment *What are the species' habitat and resource requirements?*

Patch of good quality habitat for wolves in the Simien Mountains National Park (© J. Marino).

The Ethiopian wolf is a localized endemic species, confined to isolated pockets of Afroalpine grasslands and heathlands where they prey on Afroalpine rodents. Suitable habitats extend from above the tree-line at about 3,200m up to 4,500m, with some wolves present in montane grasslands at 3,000m in the Bale Mountains. There are no recent records of the species at altitudes below 3,000m, although specimens were collected at 2,500m from Gojjam and north-western Shoa at the beginning of the century (references in Yalden *et al.*, 1980), and in most regions, subsistence agriculture extends up to 3,700m, restricting wolves to the highest mountains (Marino, 2003).

Wolves utilize all Afroalpine habitats, but prefer open areas with short herbaceous and grassland vegetation communities where rodents are most abundant, mainly along flat or gently sloping areas with deep soils and poor drainage in parts. Prime habitats in the Bale Mountains are characterized by short herbs (*Alchemilla* spp.) and grasses, and low vegetation cover. The vegetation community is maintained in continuous succession as a result of molerat burrowing activity. Other good habitats include tussock grasslands (*Festuca* spp., *Agrostis* spp.), high-altitude scrubs dominated by *Helichrysum* spp. and short grasslands in shallow soils. In northern

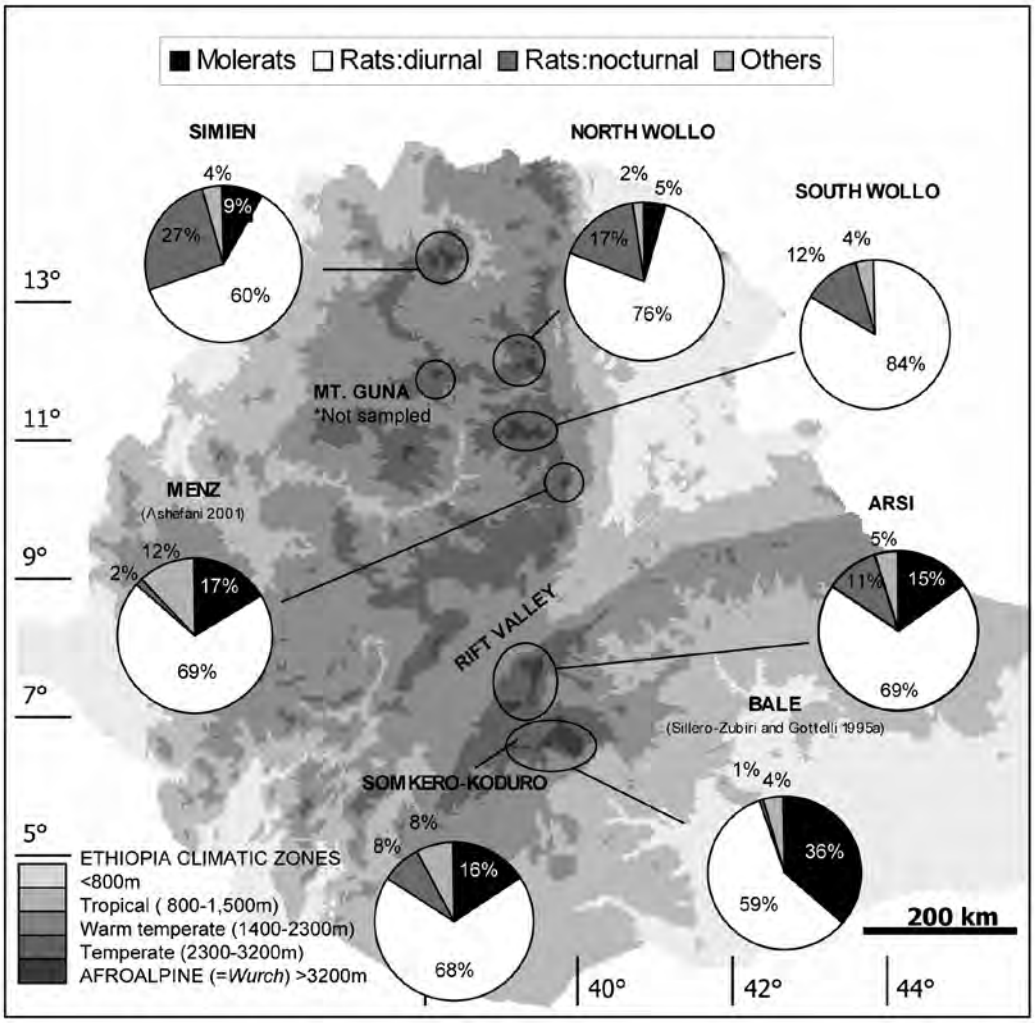


Figure 5. Frequency of occurrence of prey types in faeces from six Ethiopian wolf populations (from Marino et al., 2010).

parts of the range, plant communities characterized by a matrix of 'guassa' tussock grasses (*Festuca* spp.), 'cherenfi' bushes (*Euryops pinifolius*) and giant lobelias (*Lobelia rhynchopetalum*) sustain high rodent abundance and are preferred by wolves. Ericaceous moorlands (*Erica and Phillipia* spp.) at 3,200–3,600m are considered of marginal value, but possibly offer refuge in highly disturbed areas in Simien (EWCP unpublished data).

In the BMNP, rodent biomass varies several-fold between different habitats, and the abundance of the rodent prey is closely correlated with that of wolves (Sillero-Zubiri *et al.*, 1995a; Sillero-Zubiri *et al.,* 1995b). Short vegetation is preferred, with Afroalpine grasslands and herbaceous communities providing the optimal habitat for the species. In Bale, the giant molerat is the most important prey, largely replaced in the diet by the smaller common molerat in Arsi and Menz in the southern and central highlands respectively (Sillero-Zubiri *et al.*, 1995; Ashenafi, 2001; Marino *et al.*, 2010). In the northern highlands, the environment is drier and less productive, and the wolves here depend almost exclusively upon rat-sized prey, particularly *Otomys typus* and *A. abyssinicus*, and nocturnal species too Fig. 5 (Marino *et al.*, 2010).

6. Threats *What are the major threats to the species across the current geographic range?*

A wolf killed by rabies in the Web valley, Bale Mountains (© F. van Kesteren)

Ultimate threats. The Ethiopian wolf has been rare since it was first recorded by science. The evidence indicates that the species was always confined to Afroalpine areas, and was therefore never widespread. In optimal highland habitat, Ethiopian wolves can exist at high densities, but the Ethiopian wolf is a victim of its own success. Evolving in Ethiopia during the last glacial period, circa 100,000 years ago (Gottelli *et al.*, 2004), their ancestors specialised in hunting rodents that abounded in the then widespread Afroalpine environment (Fig. 1). During this period, Ethiopian wolves might have been at their highest abundance and with their most continuous distribution. With the onset of the present interglacial period, approximately 18,000 years ago, Afroalpine habitats started to disappear, replaced by montane forests at lower altitudes. As the habitat became increasingly fragmented, the Ethiopian wolves were stranded in mountain refugia, a process that left its mark on the current genetic structure of extant populations (Gottelli *et al.*, 2004). Clearly the species lacked the necessary ecological flexibility to adapt to the changing climate, and instead its distribution remained tied to that of highland rodents, possibly outcompeted by other carnivores (jackals and hyaenas) from inhabiting habitats at lower elevations.

In historical times, this process of habitat loss and fragmentation was exacerbated by the expansion of humans into the fertile Ethiopian highlands and the accelerated rate of climate change due to human activities across the globe. Today, the threats to Ethiopian wolf persistence are all human-induced, both directly and indirectly, stemming from a dense and increasing human population. Ethiopia now contains the second largest human population in Africa, and further large-scale human expansion is predicted, in a country where over 50% of the human population is currently under 16 years of age. The highlands of Ethiopia remain an attractive place for people to move to, due to high annual rainfalls and rich fertile soils, although the enormous pressure from expanding populations has pushed communities to the limits of sustainable agriculture and pastoralism (there are barley crops as high as 4,000m). Because they depend so heavily on small scale cultivation, food security is a continuous concern for these communities, most of which receive additional food from governments and NGOs. Increasing human populations are a global conservation problem across mountain regions, with the conversion of large swathes of natural habitats into croplands and villages. Highland species such as the Ethiopian wolf, with its highly specialized habits, face an uncertain future.

Proximate threats. These ultimate threats express themselves in more proximate causes of population decline, which are more realistic targets for conservation actions and also well-known for Ethiopian wolf populations (Sillero-Zubiri & Macdonald, 1997). These are:

- **Loss and fragmentation of the Afroalpine habitat due to high-altitude subsistence agriculture and overgrazing, road construction and livestock farming.**
- **Diseases, particularly rabies and canine distemper, transmitted by domestic dogs.**
- **Conflict with humans, resulting in poisoning and persecution in reprisal for livestock losses (real or perceived), and road kills.**
- **Hybridisation with domestic dogs, seemingly limited to Bale.**

This section aims to provide diagnoses of the processes threatening the species, with a critical analysis of the best available data, so that conservation actions can actually result in a reversal of population decline, and where feasible, increases in population size and range area. Whenever possible, the threat has been explicitly associated to a measurable effect on populations or wolf survival.

Problem: Population declines induced by disease

Threat analysis:

a) *Transmission of diseases.* Wild canids are susceptible to a number of generalist pathogens, particularly those transmitted from domestic dogs. This is both because of the close phylogenetic relationship between species which makes them susceptible to

the same diseases and because contact rates can be especially high in areas where wild canids coexist with humans and are sympatric with domestic dogs. Domestic dogs are also the most numerous carnivores globally and thus are often a reservoir for infectious disease. Among these, rabies is the most pathogenic and almost invariably fatal among populations of canids with immunologically naive individuals. Rabies has been implicated in dramatic die-offs among a number of canids, including African wild dogs, Blandford's foxes, bat-eared foxes, as well as Ethiopian wolves. Due to their fragmented distribution, Ethiopian wolves effectively live on islands in a sea of dogs. Because of the close proximity between wolves and dogs, diseases such as rabies and canine distemper virus enter the highlands and are transmitted to the wolf population (Laurenson *et al.*, 1998).

b) *Rabies in wolves.* Rabies killed many wolves in Bale over the last two decades. Well-documented outbreaks of rabies occurred in 1991 (Sillero-Zubiri *ww*, 1996), 2003 (Randall *et al.*, 2004) and again in 2008/09 (Gordon *et al.*, 2009). On each occasion, mortality was high and concentrated over a short period of time with up to 75% of the known animals dead or unaccounted for in the affected populations (Box 4). Reactive vaccinations of Ethiopian wolf packs were conducted in 2003 (Randall *et al.*, 2006), and again in 2008/09 (Gordon *et al.*, 2009) to control the spread of the disease. These examples serve to confirm the extremely high risk posed by the presence of domestic dogs in wolf habitat. There is no evidence of major disease outbreaks among wolves outside Bale (Box 4), but is also possible that outbreaks may have gone undetected elsewhere, because these were small and/or these populations are less intensively monitored.

Box 4. Diseases affecting Ethiopian wolf populations

Rabies in Bale Mountains

• In 1990, 54% (12/23) of the population under study on the Sanetti plateau died or disappeared in only 3 months. No definite cause was determined but rabies was suspected as the prime candidate.

• In 1992, 77% (41/53) of the population under study in the Web Valley died or disappeared within only 4 months. 25 carcasses recovered from five adjacent packs, 3 out of 5 study packs went extinct. Rabies virus was isolated from 3 brain samples.

• In 1997, one wolf in peripheral pack near Dinsho died from rabies.

• In 2003, 76% (72/95) of the population under study in the Web Valley died or disappeared over 6 months. 40 carcasses were collected in the Web Valley and surrounding area; in 13 out of 15 samples suitable for analysis, the rabies virus was isolated.

• In 2008, 76% (72/95) of wolves in focal packs died or disappeared. 3 out of 4 samples tested, returned positive results for rabies.

• In 2009 in West Morebawa, 66% of the known animals died or disappeared; likely the result of a separate introduction of the disease from dogs living around this wolf range, rather than the disease passing through the barrier of wolves that were vaccinated in 2008.

Canine distemper in Bale Mountains

• In 2005-2006 in Worgona Valley and Central Sanetti, 60% of known wolves died or disappeared; 2 samples from carcasses were positive for CDV. 50% mortality was reported from the dog population outside the park; 40% of dogs inside BMNP had been vaccinated between 1999 and 2005.

• In 2010, approximately 100 wolves died or disappeared from all sub-populations of BMNP. 5 out of 7 samples were positive for CDV - all negative for rabies. 7 out of 23 wolves found dead had been previously vaccinated against rabies.

Diseases in other wolf populations

• In 2010 in Guassa-Menz, several wolf carcasses were reported; a sample taken returned negative results for rabies and canine distemper, but this was of an advanced decomposed state. Concurrent CDV outbreaks occurred in domestic dogs in the area (500 rabies vaccinations same year). As of January 2011, all packs are present but an estimated 40% of wolves are missing.

• In Simien, apparent rabies and CDV epidemics are reported periodically in domestic dogs; sporadic small scale vaccination efforts have been conducted.

c) *Canine distemper virus (CDV) in wolves.* This virus is not necessarily fatal to wolves, as CDV seropositivity in wolf samples indicated that some animals can survive infection (Laurenson *et al.,* 1998), but with high CDV transmissibility, major mortality cannot be precluded. Epidemics of canine distemper can cause considerable mortality in dogs and population crashes in wild carnivores, for example lions (Roelke-Parker *et al.,* 1996). Anecdotal and serological evidence suggested that an epidemic of CDV occurred in the dog population of the Bale Mountains in 1992–93, but it was not possible to assess whether the disease spilled over into wolves and whether it affected population recovery (Laurenson *et al.*, 1998). Simulations of the effect of CDV on wolf populations suggested that it may not be significant (Mace & Sillero-Zubiri, 1997; Haydon *et al.*, 2002), but now the disease appears to be more important than previously thought, or increasing among dogs and/or wolves in Bale. Outbreaks of canine distemper affected wolves in Bale in two areas in 2005 and 2006 (Malcolm, 2006), and again in 2010 across subpopulations (Gordon *et al.*, 2010) (Box 4).

d) *Extent and long-term risks imposed by disease.* Intensive monitoring of wolves and dogs in the Bale Mountains helped to assess the effect of rabies epizootics among wolves in the Web Valley (Fig. 6). This time series shows a series of population crashes and recoveries, which indicated a certain degree of robustness against disease outbreaks in this, the largest wolf population, possibly backed up by the continuous vaccination of domestic dogs and the re-active vaccination of wolves in response to epizootics. Predictive modelling based on Bale's demographic and epidemiological parameters (Haydon *et al.*, 2002) also indicated that in the absence of diseases, Ethiopian wolf populations are impressively stable over time, with little or no risk of extinction, but as the incidence of disease increases, the probability of population persistence decreased, particularly in smaller populations (Fig. 7).

e) *The risk of consecutive outbreaks.* Populations facing consecutive outbreaks have a greater chance of extinction (Haydon *et al.*, 2002). In Bale rabies

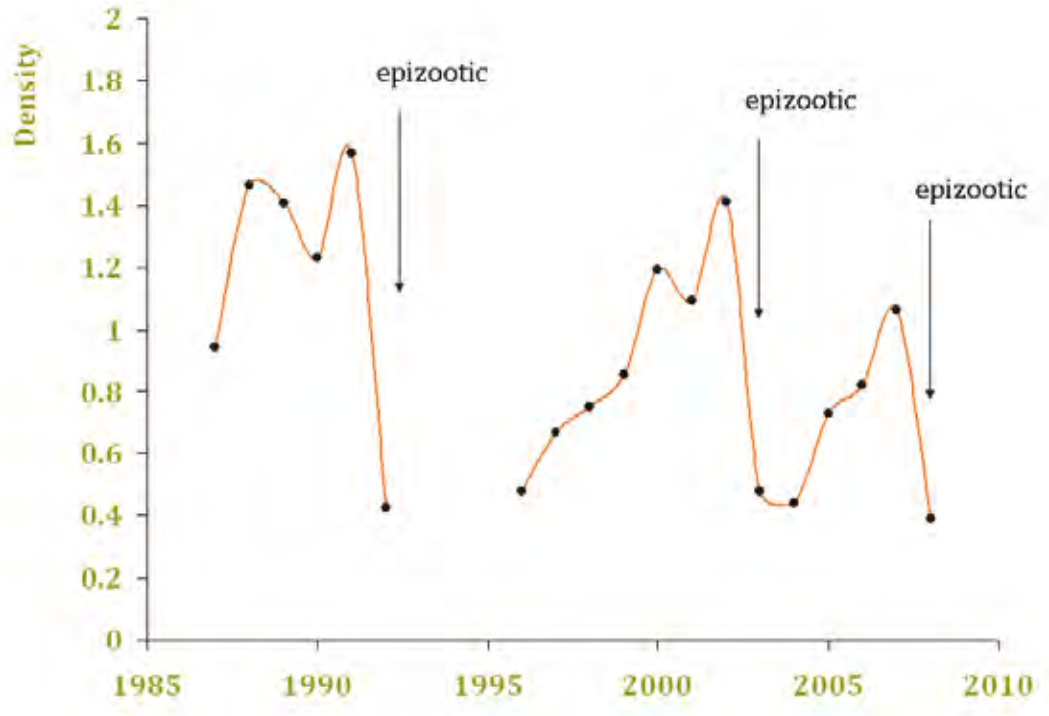


Figure 6. Time series of the density of wolves in the Web Valley study area, from close observations of focal packs (EWCP unpublished).

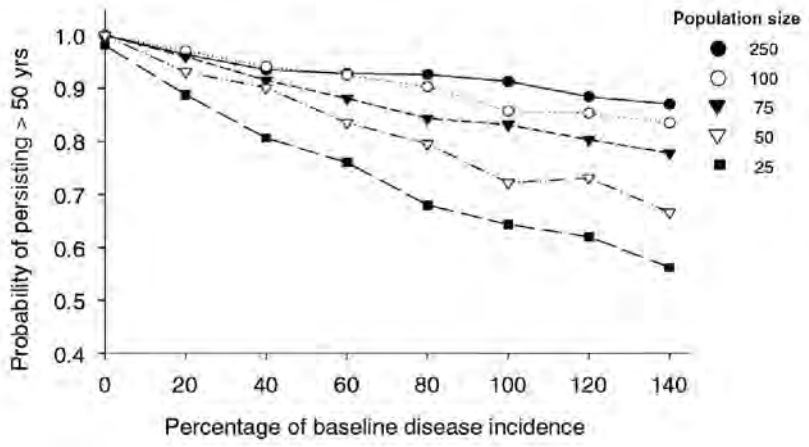


Figure 7. Proportion of 1000 simulations in which populations remained extant after 50 years using baseline demographic parameters for wolf populations of different sizes exposed to different levels of disease incidence in the dog reservoir population (adapted from Haydon et al., 2002).

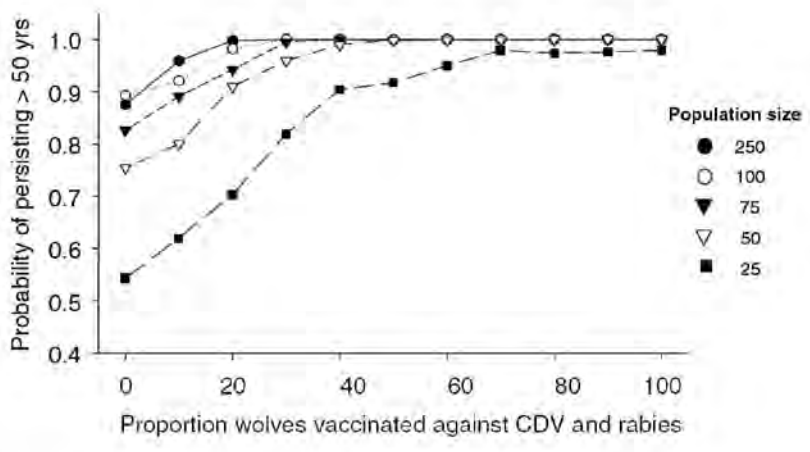


Figure 8. Predicted effects of vaccinating a variable proportion of wolves against CVD, on the probability of the population persisting over 50 years, considering different populations sizes (adapted from Haydon et al., 2002).

epidemics occurred every seven years, sometimes associated to CDV–related mortality (Mace & Sillero-Zubiri, 1997). It would seem that Ethiopian wolves can cope with outbreaks of rabies or canine distemper but that it is a major concern if the outbreaks occur simultaneously or concurrently. In the Bale Mountains the rabies epizootic of 2008/09 was followed by a canine distemper outbreak of 2010, raising concerns for the recovery of wolves in core areas. Management to prevent further disease outbreaks might be advisable after population crashes.

f) *The level of disease in domestic dog populations.* In model predictions over 50 years, the relationship between wolf population persistence and disease reduction in dogs appears approximately linear. Any reduction in disease incidence should have a beneficial effect on wolf persistence, but rabies must be almost completely eradicated before these smaller populations are almost certain to persist (which might require vaccination of at least 70% of the dog population (Coleman & Dye, 1996) in a band of up to 15 km around wolf habitat. In contrast, disease-

induced population fluctuations and extinction risks can be markedly reduced with the vaccination against rabies of a relatively small proportion of wolves (approximately 40%), as suggested by population viability models (Haydon *et al.*, 2002) (Fig. 8).

Problem: Population extinctions driven by habitat loss

Threat analysis:

a) Two population extinctions in small Afroalpine patches were recorded during the 1990s: one population in Gosh Meda, North Shoa, and a local extinction in Guguftu, in South Wollo (Marino, 2003). In both cases, the extent of Afroalpine habitat above the limit of agriculture was less than 20km^2, suggesting a minimum area requirement for sustainable populations. In 2011, the EWCP team confirmed the extinction of wolves in Mt. Guna (Gondar) where numbers have been in single figures for some years. Areas peripheral to a wolf population and not yet converted to agriculture may also be susceptible to remain unoccupied, for example in Bale (Box 1 graph d) and the heavily grazed pastures of Kebero Meda (Delanta, South Wollo; EWCP unpublished data).

b) The presence of resident wolves in almost every Afroalpine remnant suggests the species has some resilience to fragmentation and the effects of small population sizes, but possibly with the exception of Bale, all populations are small and susceptible to extinction from deterministic and stochastic factors (Soulé, 1987). As Afroalpine remnants approach this apparent critical size, factors which might cause a slight perturbation in a large population can have catastrophic effects on the persistence of small populations (Soulé, 1987). For example, population models indicate that disease outbreaks in the smaller populations could easily lead to a local extinction (only 20% of populations that dropped below 20 individuals in the models recovered to twice this figure) (Haydon *et al.*, 2002) (Fig. 9).

c) The loss of wolf habitat is directly linked to the expansion of agriculture into the Afroalpine zone. In rural areas of the northern highlands, human densities are among the highest in Africa (300 people/km^2 in some localities) and the demand for land for crops is mounting. In Ethiopia, virtually all areas below 3,700m have been converted to barley fields. The suitable patches that remain below this limit are under some level of protection (Guassa-Menz in

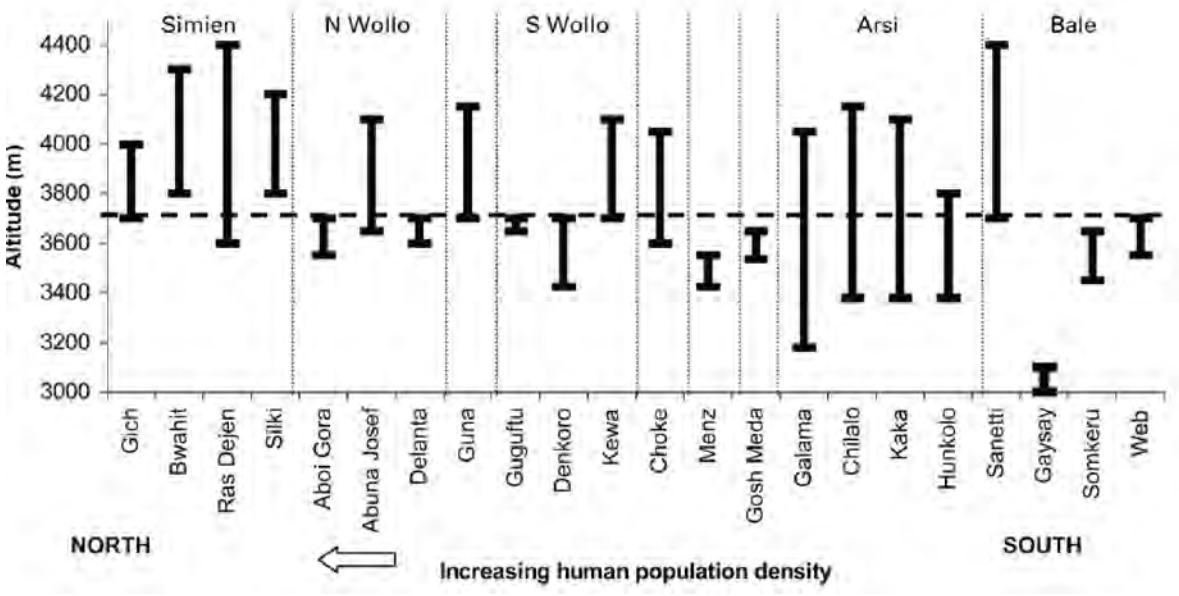


Figure 9. Altitudinal distribution of Ethiopian wolf habitats. Bars represent the altitudinal range of remaining suitable habitat in each area surveyed and in the Bale Mountains. The dashed line at 3,700 m indicates the approximate limit of sustainable agriculture in Ethiopia (from Marino, 2003).

North Shoa and Denkoro Reserve in South Wollo) or in the Southern Highlands (Arsi and Bale Mountains). The wolf populations most imminently threatened by habitat loss are bound to be those contained within relatively low lying Afroalpine ranges (e.g. Aboi Gara and Delanta in North Wollo).

d) Rates and patterns of land conversion to agriculture were studied in 2009-2010 in North Wollo. A net decrease of 34.1% (or 215.3km^2) of Afroalpine habitat was recorded for the period 1985-2003 (Funkenberg, 2010). The 'change image' in Figure 10 shows most acute losses in lower lying ranges (Delanta in comparison with Abuna Yoseph) . In Abuna Yoseph local human populations rely on natural resources that are also affected by agriculture expansion, including highland pastures and firewood (Eshete, 2010).

Problem: Increasing fragmentation and isolation

Threat analysis:

a) Detailed maps of Afroalpine remnants show various degrees of fragmentation across the six isolated populations (Fig. 11). Some are highly fragmented (North Wollo), others largely continuous (Bale), or formed by patches and corridors (Simien). Given current rates of human population growth, further fragmentation can be expected, as well as increasing isolation between populations previously connected by dispersion.

b) Fragmentation in North Wollo is particularly worrying. Landscape indices calculated from land-cover maps in Fig. 11, show number of Afroalpine patches increasing between 1995 and 2003, while their average surface area decreased (Funkenberg, 2010) (Fig. 12). As a result, the perimeter of Afroalpine habitats in contact with the agricultural frontier increased by 1,617 km.

c) The conservation implications of the increasing fragmentation and isolation of wolf habitats are two-fold: the ones associated with the increasing contact between wolves, people, their dogs and livestock, and those related to the genetic integrity of the extant populations. Clearly, fragmentation increases the

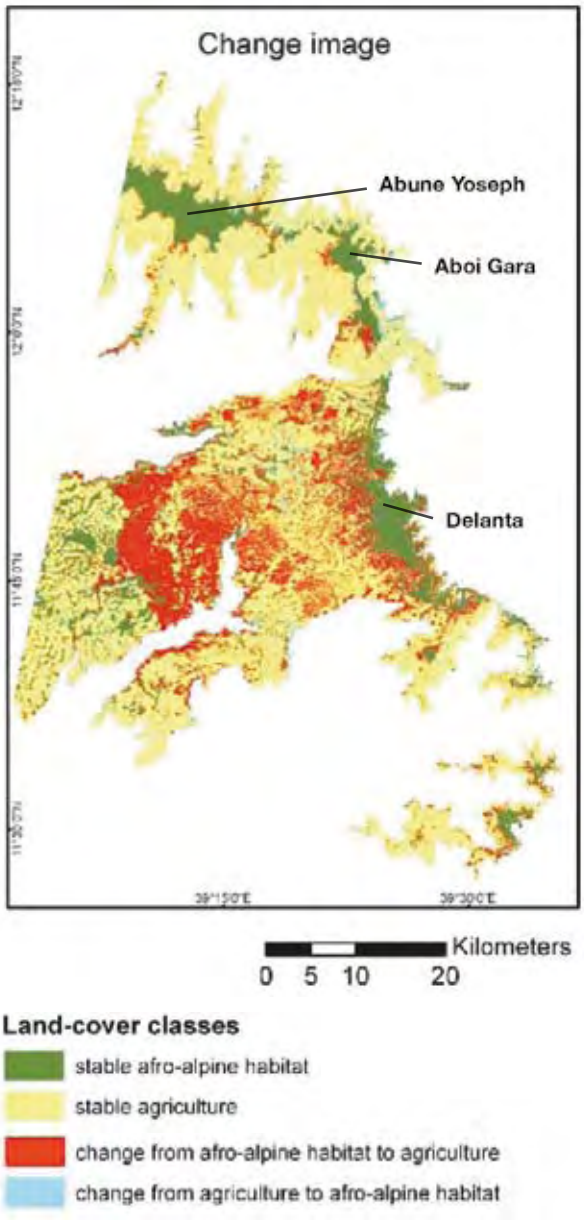


Figure 10. Land cover changes in the North Wollo highlands (from Funkenberg, 2010). In red, the Afroalpine areas converted to cropland between 1895 and 2003. The Afroalpine category includes various land classes representing natural vegetations (grassland, shrubland, grass-shrubland, erica, swamp and forest (a very small area)) and bare land class representing rocky outcrops.

perimeter to area relationship of Afroalpine remnants, and with it the frequency and severity of contact between wolves and dogs, as well as the levels of disturbance and interference by people. Fragmentation also leads to small population sizes, intensifying the demographic vulnerability of extant populations to extinction and the risk of inbreeding. At present, there

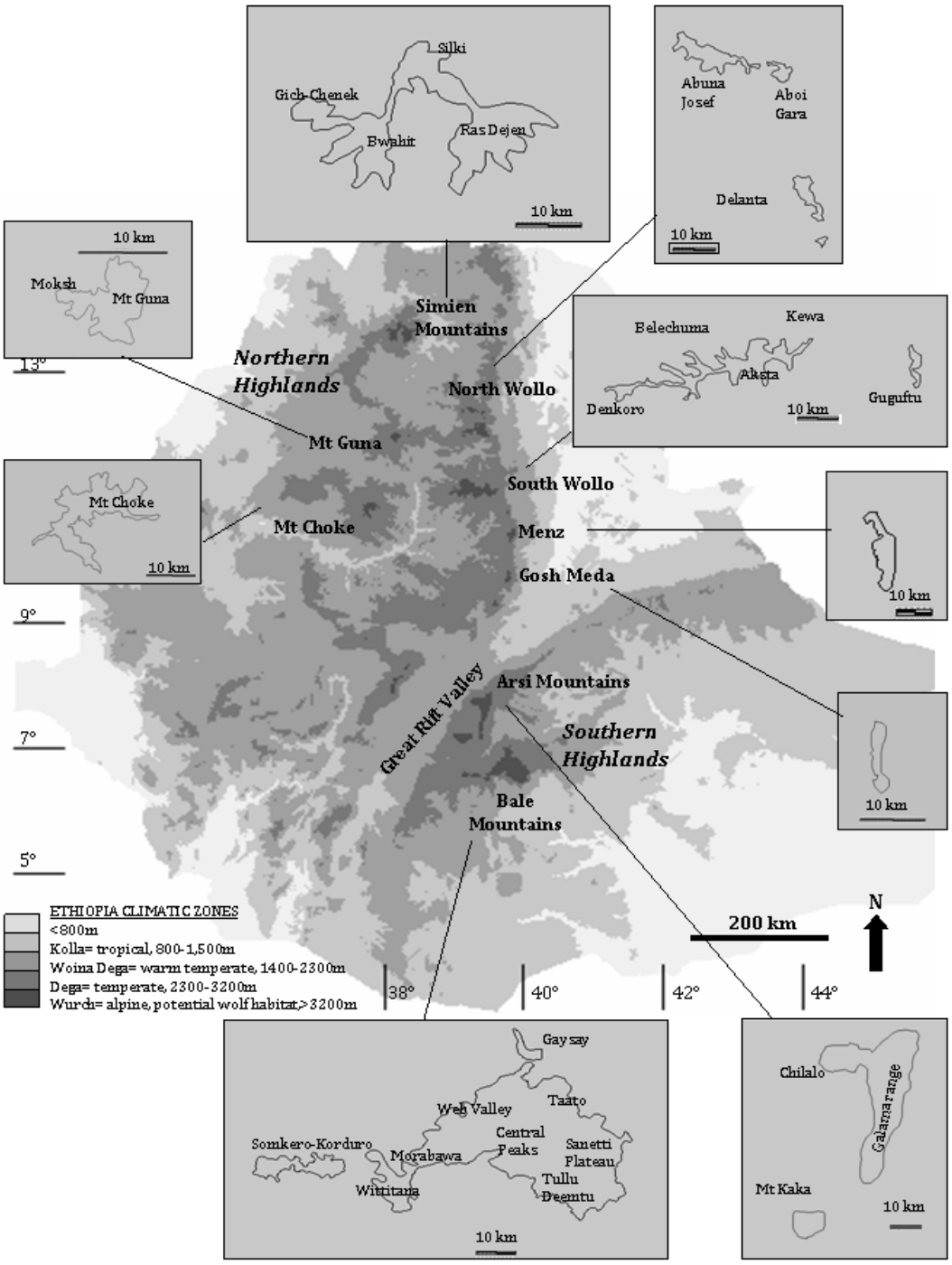


Figure 11. Afroalpine ranges and remaining wolf habitat in Ethiopia. Ethiopia's climatic zones are illustrated in a gradient of gray. The detailed maps (a to i) illustrate the current distribution of suitable wolf habitats (from Marino, 2003).

is no evidence of inbreeding depression or reduced fitness, yet the extremely small breeding size of some of the populations, particularly those north of the Rift valley, raises concerns (Gottelli *et al.*, 2004; Randall *et al.*, 2007). With regards to the effects of increasing isolation, the extant wolf populations currently show levels of differentiation higher than those reported for other canids (Gottelli *et al.*, 2004). This is because the Ethiopian wolf is a habitat specialist, unlikely to undertake long distance dispersal due to the lack of corridors connecting populations. For all these reasons, a balanced in situ management program for the Ethiopian wolf should aim both to maintain historic levels of variation within, and gene flow among, populations (Gottelli *et al.*, 2004). A more detailed study of patterns of gene flow among populations is needed.

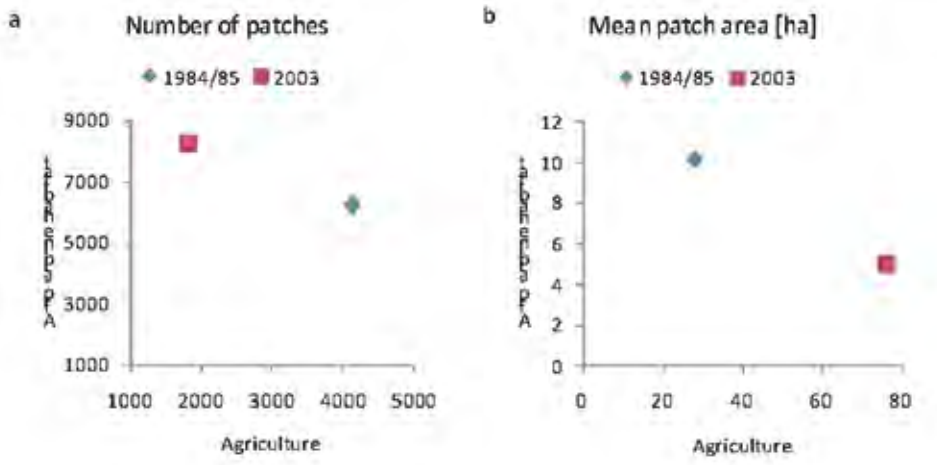


Figure 12. Landscape indices derived from land cover maps of the North Wollo Highlands (from Funkenberg, 2010).

Problem: Encroachment within protected areas

Threat analysis:

There is a general consensus on the need to protect wolves and their habitats from expanding human populations. Existing protected areas may offer the best opportunity for the long-term persistence of some populations, but these Afroalpine areas are already under very intense human pressure.

a) *Simien Mountains National Park* The problem of encroachment affecting this Park has been well documented and recently assessed in the new Management Plan (SMNP, 2009). In Simien, numbers of livestock are increasing with the human population, at 2% per year (Beltran, 2000; Magin, 2001). The construction of roads has increased local traffic and made access easier for the increasing numbers of peasant farmers (Nievergelt *et al.*, 1998; Beltran, 2000). In October 2005, the Park office found 3,171 people in 582 households living in the Park and 1,477 householders outside the Park but owning farmland within (SMNP, 2009). Since then, the area of the park was significantly expanded, further settlement in the Park has been stopped and further grazing restricted, although effective enforcement may take years (UNESCO, 2006). There are now about 30,000 people in 30 villages around the Park and two within it; including some 4,650 cereal farmers and perhaps as many herders, woodcutters and others.

b) *Bale Mountains National Park* The encroachment situation in Bale was assessed in the latest General Management Plan (BMNP, 2010) and the assessment continues with the subsequent monitoring programme implemented by FZS and partners. There are numerous villages situated within and around wolf habitat in the Bale Mountains (Fig. 13), comprising over 8,500 households with more than 12,500 dogs (EWCP, unpublished data). In 2007, the number of households in Afroalpine habitats was 1,756 (FZS, unpublished data). Due to the widespread coexistence of wolves with people and dogs, the risk of dog-to-wolf disease transmission is serious (Randall *et al.*, 2006). Alongside encroachment comes the use of fire as a management tool, and unintentional fires (Abera & Kinahan, 2011). In Bale, fires are frequent in ericaceous moorlands, which provide some habitat for wolves around the core areas. A study based on remotely sensed data indicates that a) Erica shrubs are burnt more than expected given its availability, b) fires are most frequent in the highest elevation belt, and c) the frequency depends on the distance to roads and nearby settlements. Of major concern for Ethiopian wolf conservation are changing land uses in the Afroalpine areas, traditionally used for livestock grazing on a seasonal basis. The numbers of livestock grazing in Afroalpine pastures are increasing (Fig. 14) and in the last eighteen months alone, EWCP reported 21 new houses and 18 new crops in East Sanetti, five new houses in East Morebawa, and 13 new houses in the Web Valley (EWCP report submitted to EWCA, November 2010).

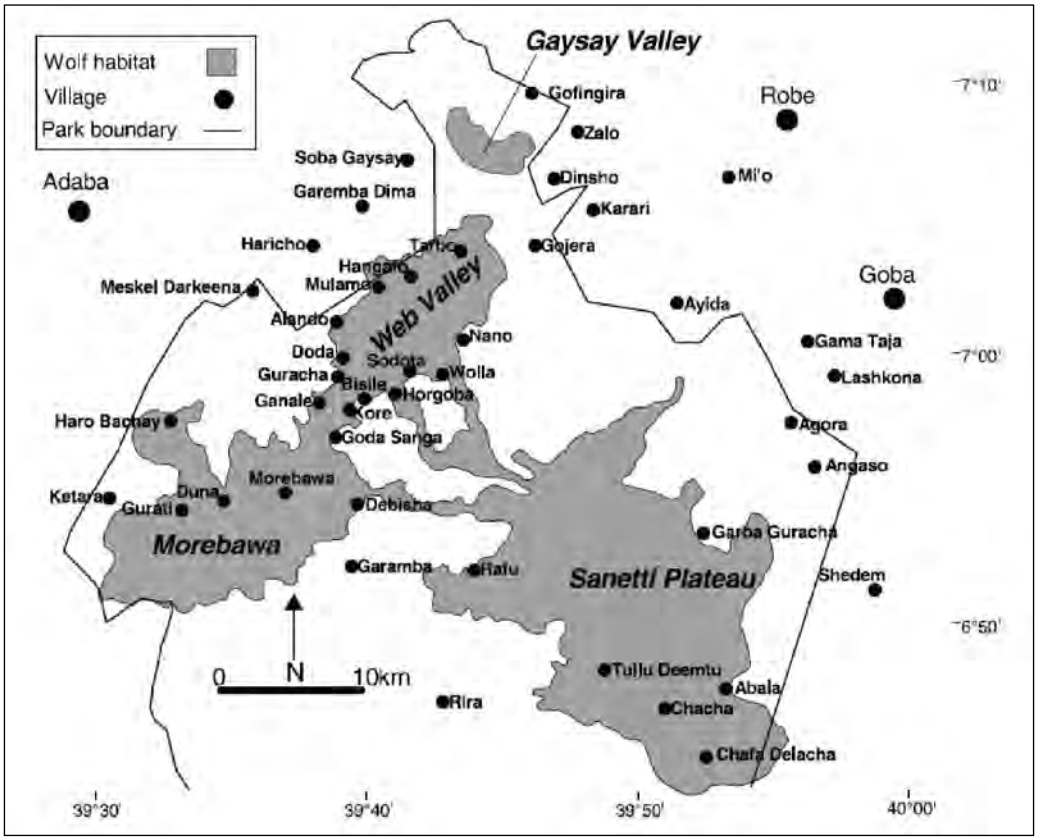


Figure 13: Human settlements in and adjacent to wolf range in the Bale Mountains National Park, Ethiopia. Larger circles represent urban centers in the region; while smaller circles represent rural villages (From Randall et al., 2006).

Problem: Habitat deterioration by overgrazing

Threat analysis:

a) While Ethiopian wolves in Bale have adapted to using cattle herds as a foil for hunting rodents (Sillero-Zubiri & Gottelli, 1995a), high levels of grazing in the highlands can reduce the vegetation available for the rodent prey that the Ethiopian wolves depend on. Although there is no empirical evidence of wolf population declines linked to overgrazing, grazing is known to affect the composition of the rodent community in Guassa-Menz (Ashenafi *et al.*, 2005) and clearly, high grazing intensities are resulting in erosion and vegetation deterioration in Afroalpine areas such as Delanta in South Wollo (EWCP unpublished data), and in areas of Simien (Nievergelt *et al.*, 1998). The EWCP long-term monitoring of livestock abundance within wolf habitats in Bale showed that densities are increasing and grazing regimes changing (Marino *et al.*, 2006; Vial *et al.*, 2010).

b) A series of simple dynamic food chain models have been developed to explore the interactions between trophic levels of the Afroalpine ecosystem in Bale and how they might be affected by livestock grazing (Vial *et al.*, 2011). These models predicted that rodent and/or wolf populations can both remain at densities close to their ungrazed equilibrium as livestock density increases, but will rapidly crash once vegetation biomass collapses as a result of the increased grazing pressure. The maximum sustainable livestock density predicted by the model lies between 32 and 117 Tropical Livestock Units (TLU)/ km^2, above which populations of wolves are expected to become locally extinct. The Web Valley and Morebawa are currently stocked at an estimated 195 and 149 TLU/ km^2 respectively, whereas the Sanetti plateau (49 TLU/ km^2) currently lies within the resilience 'envelope' for the system. These results provide a first step towards enabling managers to predict the implications of changing patterns of human impact on rangelands and support the identification of sustainable grazing grounds for livestock. The models also revealed that monitoring primary productivity alone may be a simple and effective way to detect stresses on food chains and predict the impact of increased livestock grazing on higher trophic levels. In the context of the BMNP, the models indicated that some areas of high conservation value appear to be exploited unsustainably, thereby possibly affecting long-term conservation goals for the Ethiopian wolf.

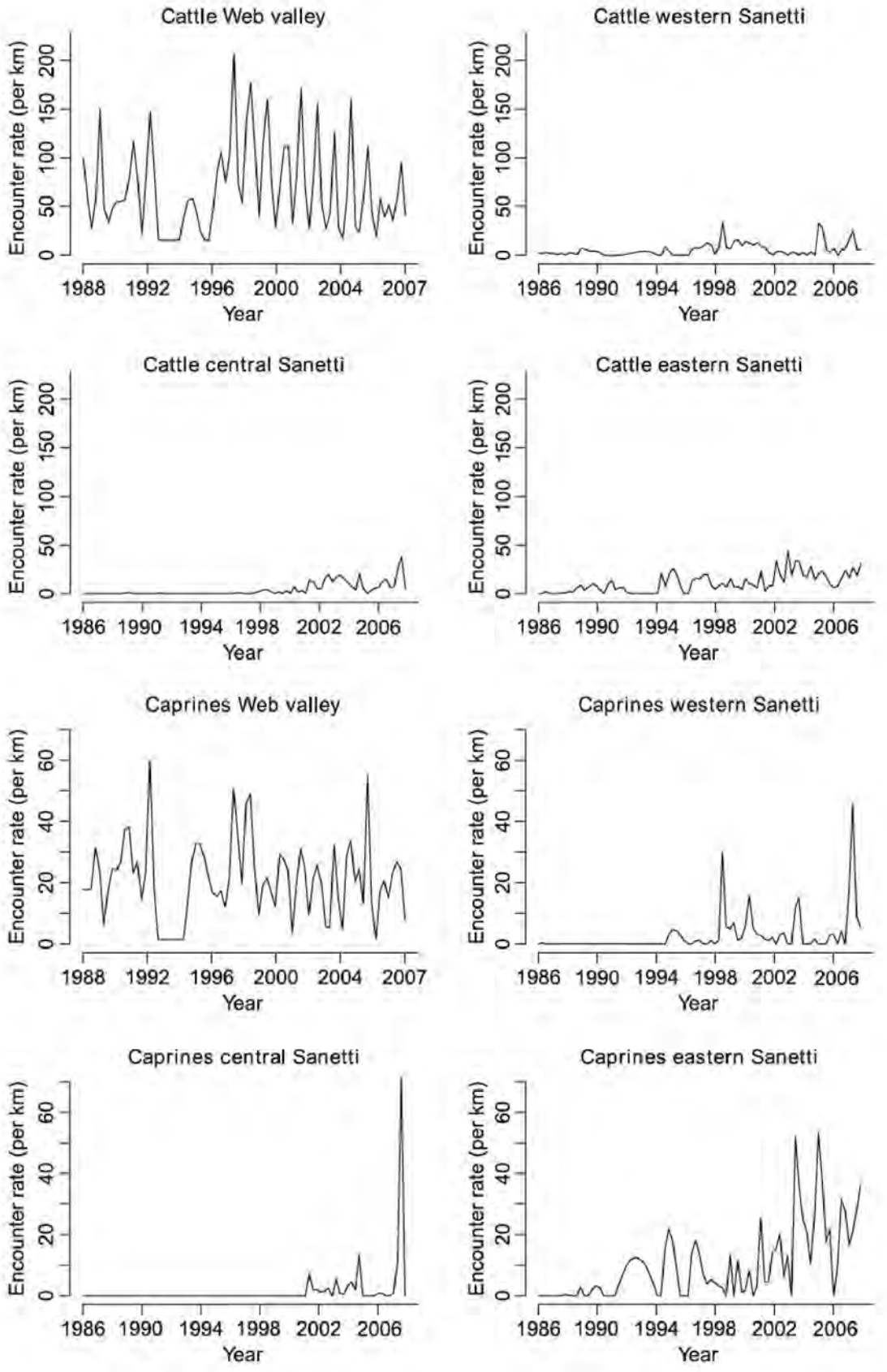


Figure 14. Regularized time-series of the encounter rate (individuals per km survey) of cattle (top) and caprines (bottom) in the Web valley, eastern/central and western Sanetti (from Vial et al., 2010).

Problem: Increasing persecution and disturbance in areas of high human density

Threat analysis:

a) Evidence of direct interference by people in Ethiopian wolves' behaviour is the short flight distance and elusiveness shown by wolves in areas with high human presence such as Simien (EWCP, unpublished data), where species of nocturnal rats, not a conspicuous prey item elsewhere, account for almost a third of the prey occurrences in the diet (Marino, 2010). Also, wolves tend to be active at dawn and dusk in Simien, in contrast with the diurnal habits of wolves in Bale, synchronized with the above ground activity of rodents (Sillero-Zubiri *et al.*, 1995b). Human interference, and the active chasing of wolves by herders, have the potential to affect foraging efficiency and the survival of wolves in some populations

b) In the recent past, the general pattern of wolf persecution has reflected the political situation in the country. During periods of instability, guns were more available and killings were more frequent. It is likely that the extinction of wolves in Mt. Choke was prompted by persecution. Now in some regions, people living close to wolves believe that numbers are recovering through successive years of good breeding and less persecution (Marino, 2003). Still, the degree of conflict due to predation on livestock determines the negative attitudes to wolves in some regions where persecution may persist.

c) Until recently, wolves in Bale were unmolested by humans and did not appear to be regarded as a threat to sheep and goats, which are sometimes left unattended during the day. Only two instances of predation upon lambs were recorded during 1,800 hours of observation (Sillero-Zubiri & Gottelli, 1994). Losses to wolves in the southern highlands have been dismissed by herders as unimportant when compared to damage by spotted hyaenas (*Crocuta crocuta*) or jackals. Elsewhere, the level of conflict is higher, and wolves have been persecuted due to their reputation as predators of sheep and goats, although livestock remains were uncommon in droppings collected from across the highlands (Marino *et al.*, 2010). As people move livestock into wildlife areas, there is a natural concern of conflict with wildlife. While there are some reports of direct conflict with Ethiopian wolves, these seem few and far between. Nonetheless, this direct conflict should not be ignored as a threat to the Ethiopian wolf, as there have been some cases of retaliatory killings, e.g. in the Arsi mountains (EWCP unpublished data), with potentially significant effects in the smaller isolated populations.

d) There are no reports of exploitation for furs, although some opportunistic use may occur. For instance, in parts of Wollo wolf skins were seen used as saddle pads (Sillero-Zubiri, pers. obs.). In the past, sport hunters occasionally killed wolves, but no hunting is currently permitted.

e) On the Sanetti Plateau in Bale, an all-weather road runs across 40km of prime wolf habitat and at least four wolves have been killed by vehicles since 1988 (Sillero-Zubiri, pers. obs.). Two other animals have been shot from the road and another two were left with permanent limps from collisions with vehicles. Similar accidents may occur on other roads across wolf habitat such as the Mehal Meda road in Menz, and the road to Ticho in Arsi. An increased human population also increases the risk of road mortality for wolves, particularly in the Bale Mountains, the Simien Mountains and the Arsi Mountains where major roads pass through wolf habitat.

Problem: Hybridisation with domestic dogs

Threat analysis:

In Bale, there have been incidences of Ethiopian wolves hybridising with domestic dogs. Historically, four hybrid wolves were known, all in the Bale Mountains, which were all sterilised. Although hybrids have been confined to the Web Valley, they may threaten the genetic integrity of the wolf population. Some introgression of dog genes in the Ethiopian wolf gene pool has been detected using mitochondrial DNA (Gottelli *et al.*, 1994) as a result of crosses between female wolves and male domestic dogs. Hybrids have shorter muzzles, heavier-built bodies and different coat patterns. Following hybridisation, a population may be affected by outbreeding depression or a reduction in fitness, although to date this does not seem to have taken place in Bale. So far, there is no indication of hybridisation taking place outside western Bale.

7. Conservation and management

What current conservation measures are in place?

Vaccinating wolves in Sanetti in 2009 (© A. Stewart).

The Ethiopian Wolf Conservation Programme

In the Bale Mountains, the EWCP has been working for the conservation of the Ethiopian wolf since 1995, progressively developing a multi-pronged strategy that involves: community outreach and education, protected area support, disease management, and continued research and monitoring of wolf populations. Conservation management of the wolves has focused on mitigating both long and short term threats to the populations. In 2004, the EWCP internally assessed its conservation work in Bale (EWCP, 2004) and developed a five-year work plan (EWCP Strategic Plan, 2004–2009).

To ensure progress and success at the decision-making level the programme has sought close cooperation and understanding between the relevant conservation bodies, both governmental and non-governmental, in order to gain the crucial acknowledgement and visible support that all conservation projects need. Working closely with both federal and regional conservation bodies, and its NGO partners, EWCP seeks to promote the wolf as a flagship species within its environment – successful conservation of the Ethiopian wolf and its Afroalpine habitat will have important benefits for various other Ethiopian endemics, such as the giant molerat and endangered mountain nyala (*Tragelaphus buxtoni*), not to mention the important ecosystem processes that will be preserved.

Community outreach and education.

Community understanding of a conservation issue and the need for action is the first step towards securing

local support and buy-in for a conservation programme. Outreach programmes involving the community at various levels, from school children to village elders, have been continuously implemented in the Bale Mountains, and more recently in other areas, to achieve this awareness and resultant desire for positive action. Awareness of the wolves and their plight has increased since 1999, with more attention, both nationally and internationally, focused on their conservation. The effectiveness and achievements of the education programme in Bale was reviewed in 2010.

Within the Bale area, the EWCP education officer regularly visits 11 schools, and reaches close to 2,000 students and teachers with the environmental education programme. The outreach work extends to local communities within and surrounding the National Park and focuses on natural resource protection and the conservation of the wolves. The objective is to assess understanding of the communities on conservation issues relating to the National Park and how this affects them, while simultaneously identifying the needs of the communities and how these needs complement or conflict with conservation efforts. This allows conservation organisations working in the area to better address threats to the Afroalpine ecosystem.

In Arsi and North Ethiopia, education work centres on the formation of nature clubs within schools. In Arsi, over 800 teachers and pupils are involved with environmental activities and natural resource conservation. This includes taking the pupils on field trips to the mountains to expose them to the wolves and their habitat. The Arsi education officer works to introduce the concept of sustainable natural resource use into the schools, using them as a springboard to making the wider community aware of these initiatives. In North Ethiopia, the education programme incorporates numerous schools in Abuna Yoseph/Lalibela, South Wollo, Menz (North Shoa) and North Gondar.

Awareness creation also involves numerous annual festivities, aimed at celebrating the Afroalpine and the Ethiopian wolf. In Bale and Arsi, annual Wolf Days are held, involving more than 1,000 school pupils and community members in games, sports matches, art displays and dramas, while in North Ethiopia, World Environment Day is celebrated in a different Afroalpine area every year. In addition, World Rabies Day is commemorated annually in Bale, with the local children getting involved in awareness campaigns targeting the local community.

Habitat protection

More focus is now being placed on effective protected area management, and the establishment of new protected areas. It is imperative for the survival of the wolves and other endemic species, as well as for the maintenance of ecological processes, that these areas are successfully conserved. The official recognition and formal gazetting of protected areas is a step in the right direction. However, any conservation activities have to reconcile the needs of the local community with those of the wolves. Currently, there is only a small tangible benefit to those communities surrounding wolf populations, through the provision of jobs linked to conservation organisations, and those related to the provision of tourism services in wildlife areas. Irreplaceable benefits derived from healthy, functioning ecosystems are often too abstract for communities to understand. It is a difficult balancing act that must be careful not to compromise conservation over development, as the two must go hand in hand.

A conservation initiative implemented by FZS in Ethiopia aims at supporting community-based natural resource management in four key Afromontane areas in Ethiopia: Bale Mountains, Simien Mountains, North Wollo and Guassa-Menz, and to increase human and institutional capacity for natural resource monitoring. In Guassa-Menz, EWCP and FZS have supported traditional resource management practices and tourism initiatives that support the community with tangible income from conservation of this Afroalpine area. These initiatives help to show the community that conservation provides income as well as support for rural communities in poverty alleviation endeavours. In Guassa, there is a community lodge with basic facilities and all income collected from the tourism goes directly to the community. Other activities related to tourism development are the production and sale of souvenirs, micro-financing from the community tourism income, guiding, porters, mule rent, sale of food and firewood by the community.

Box 5. Disease management: What are the options?

1. Do nothing
2. Reduce dog-wolf contact: remove dogs from wolf areas and/or prevent overlap
3. Stop diseases in reservoir dogs
4. Directly vaccinate wolves as emergency measure
5. Directly vaccinate wolves as preventative measure

Most of these alternatives have been tested in the Bale Mountains since 1996. Vaccinations of both host and target populations have been and will continue to be important strategies for disease management in Ethiopian wolves, as the results of the interventions have shown that such approaches can control spill-over infections and lessen the severity of outbreaks (Randall *et al.*, 2006). The strategy, however, may vary with the population, disease risk and type of disease.

Research and monitoring

The actions implemented to protect Ethiopian wolf populations have been shaped and designed from over 20 years of scientific research and publications, combined with the continuing monitoring of wolf populations. This scientific research currently sees the sixth PhD being completed on the Ethiopian wolf. Knowledge of the situation and threats faced by the wolf is current, allowing EWCP to adapt its management and actions to varying circumstances and situations, a vital skill to ensure the ongoing success of a conservation project. Detailed demographic, spatial, and epidemiological data gathered in the Bale Mountains through long-term monitoring and targeted research have been central to assessing the severity of disease outbreaks, population recovery, and the role of disease in population viability. In addition, these data have allowed for the development of control strategies to eliminate the threat of disease or reduce it to a level that will ensure population persistence (Randall et al., 2006).

Although based in the Bale Mountains, EWCP maintains a presence in the six other wolf populations, in places through their partnership with FZS, and carries out regular monitoring and education activities throughout wolf range. The ongoing monitoring of all Ethiopian wolf populations has allowed for a greater understanding of the behaviour and demography of the wolves, as well as providing an early warning system for threats such as disease outbreaks and increasing human pressure in wolf habitat. Currently, EWCP regularly monitors 18 focal packs and 42 peripheral packs in the Bale Mountains, as well as nine packs in the Arsi mountain range and six packs in Simien. Annual monitoring trips are also carried out in the three other northern populations.

Disease management

The long-term involvement of EWCP to manage and mitigate the threat of rabies to the conservation of Ethiopian wolves has involved a number of research and conservation organizations both on the ground in Ethiopia and abroad. The disease management strategy has been both multi-disciplinary and adaptive over time. Of critical importance has been the long-term monitoring program in Bale, which ensures rapid detection of outbreaks by observation of clinical signs and/or discovery of carcasses, and the diagnosis of putative disease agents by post-mortem analysis. Monitoring is also the first step in responding to outbreaks when they do occur and both empirical and theoretical evidence suggests that intervention in such circumstances is worthwhile.

The threat of rabies is of critical importance to the conservation of Ethiopian wolves, and over time, several options have been considered to curtail this risk (Box 5). However, it is currently impossible or at least unfeasible to eradicate rabies in the area, which means any and all dog-to-wolf contact should

be eliminated. Within the current political context in Ethiopia and under current conservation policies, people and dogs are unlikely to be removed from all wolf range. For this reason lessons from past work are paving the way for future developments in disease research and management for this species.

a) Reduce dog-wolf contact: remove dogs from wolf areas and/or prevent overlap. Between 2000 and 2002, EWCP carried out a domestic dog sterilisation campaign in the Bale Mountains to try and reduce future numbers of domestic dogs. 496 dogs in the target areas were sterilised - 69% of the male dog population and 22% of females (EWCP internal report, 2004). However, it was shown that in order to effectively reduce future dog numbers, 95% of the male dog population would have to be sterilised, as well as a significant percentage of the females. The campaign encountered a number of problems during its duration that contributed to the lower number of dogs sterilised:

- Dogs were not at the homestead
- Owners were not at home
- Dogs were very wild and could not be caught
- Despite reassurances from the team, people were afraid the anaesthetic would kill the dogs
- People thought males wouldn't guard well after sterilisation
- People wanted their females to be able to breed
- People wanted food for their dogs after the operation
- Large investment of time and resources

The campaign was discontinued for many of the reasons listed above, and it was suggested that in future, perhaps oral contraception of dogs might be worth exploring, as well as removing the need for dogs, thereby reducing numbers.

b) Stop diseases in reservoir dogs. As disease has been identified as the most immediate threat to the persistence of the Ethiopian wolves, ongoing vaccination of domestic dogs is carried out with the aim of creating a boundary of vaccinated dogs within and around wolf range. Since 1996, more than 62,000 domestic dogs have been vaccinated by EWCP against rabies (Stewart *et al.*, 2010). The ongoing vaccination of domestic dogs not only removes this very real threat to the continued survival of the wolves, but is of huge socio-economic benefit to the local communities who lose not only their valuable livestock to the disease, but also face the risk of rabies transmission to themselves and their families. However, despite the enormous effort and resources allocated to this activity, deadly diseases are still transmitted from the dogs to the wolves due to the ever increasing human population, and hence dog population, in wolf habitat.

Unfortunately, sufficient coverage is impossible to achieve in a wide enough zone in Bale, due to the nature of dog ownership in Ethiopia, which results in generally wild and unmanageable dogs, making the vaccination process very difficult and labour intensive. Oral vaccination trials in dogs in Bale did not significantly improve coverage due to poor commercial bait uptake. In addition, community support for vaccinations can be slow in coming, due to misconceptions about the effects of vaccinations on the dogs (that it makes them lazy or sick). EWCP has worked hard to garner the support of the woredas surrounding the Bale Mountains, which has helped significantly with the effectiveness of the vaccination programme, but in the northern parts of the country, a once-off vaccination campaign still requires significant education and outreach effort before it can take place.

Still the vaccination of dogs continues under the premise that every dog vaccinated reduces the risk to the Ethiopian wolf population. Every effort should be made to increase dog vaccination coverage in the current vaccination area in Bale, and analyses are currently underway to develop a more targeted vaccination campaign that doesn't require additional resources and which will also incorporate the large amount of transhumance in Bale. Elsewhere, limited resources have allowed for less of a focus on domestic dog vaccinations, but EWCP has responded numerous times over the past eight years to reports of rabies in the northern populations, and has sent the vaccination team to vaccinate in these areas:

- Between May and July 2003, EWCP vaccinated 835 dogs in the Guassa area of Menz.
- In November/December 2003, in response to an outbreak of rabies amongst domestic dogs in the same area, the Mehal Meda agriculture office vaccinated 200 dogs with EWCP funding.

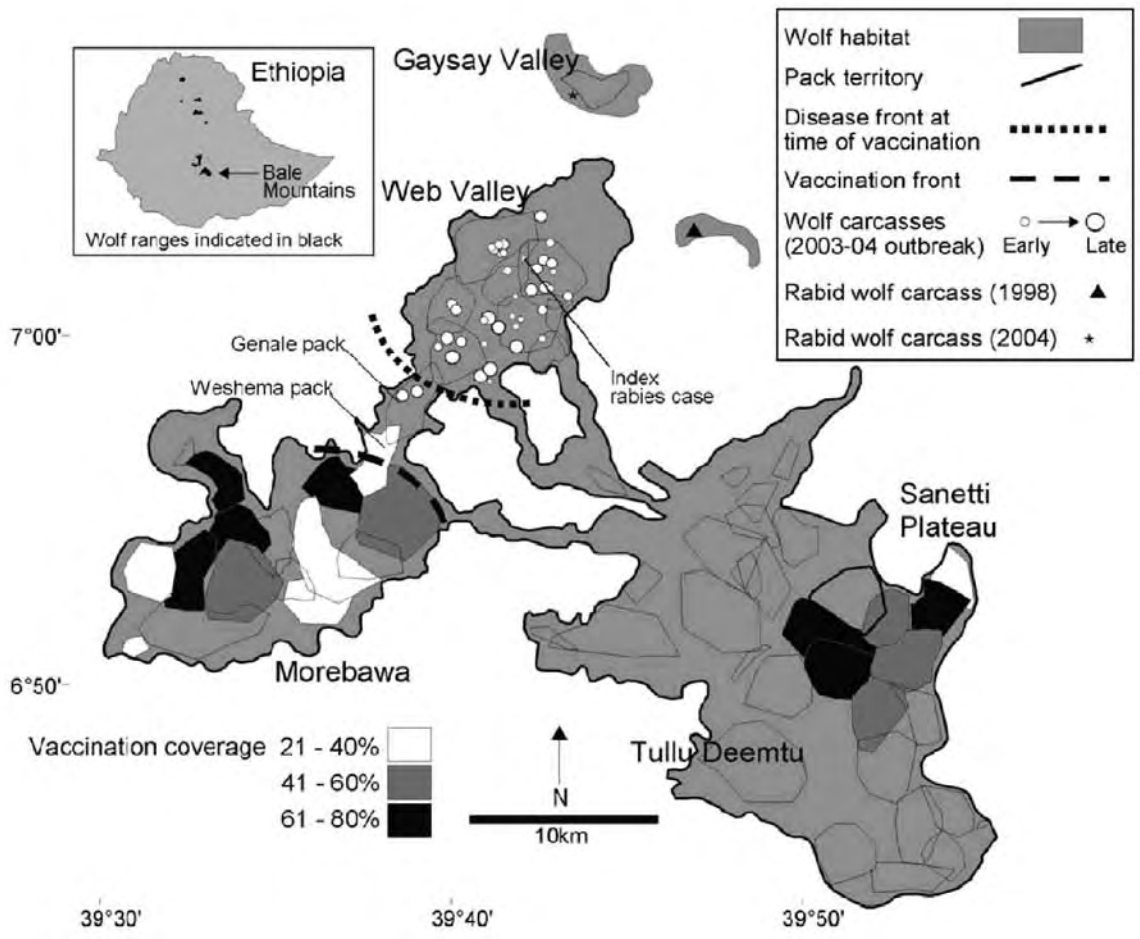


Figure 15. Wolf habitat and study areas in the Bale Mountains: Web Valley, Sanetti Plateau, Morebawa, Tullu Deemtu, and Gaysay Valley. Known pack territories are designated by polygons. Carcasses collected during the 2003–2004 rabies epidemic are indicated by white circles, with the size of the circle denoting the relative time of death. Within pack vaccination coverage during the 2003–2004 emergency vaccination campaign is shown in lower legend. Unvaccinated packs are designated by unfilled polygons. Single cases of confirmed wolf rabies in 1998 and 2004 are also shown (from Randall et al.*, 2006).*

- In 2003, EWCP vaccinated 134 dogs in Delanta, North Wollo.
- In Feb/March 2004, 189 dogs were vaccinated by EWCP in Mehal Meda town after a reported rabies outbreak.
- More recently, EWCP sent a vaccination team to Simien and Guassa on three occasions in 2009 and 2010, during which time over 1,100 domestic dogs were vaccinated.

c) Directly vaccinate wolves as emergency measure. When rabies outbreaks do occur, permission is then granted by the federal authorities for EWCP to directly vaccinate a limited number of wolves to try to prevent the disease from spreading and affecting more of the population. Direct vaccination of the wolves has occurred in 2003/04 (84 individuals), 2008 (50) and 2009 (48), meaning that 182 Ethiopian wolves in the Bale Mountains have been vaccinated against rabies to date (Fig. 15).

Analysis of the 2003 rabies outbreak among Ethiopian wolves provides unequivocal evidence of the effectiveness of reactive vaccination in curtailing rabies outbreaks in Ethiopian wolves (Randall *et al.* 2006). The trials were rigorously conducted to test the effectiveness of injectable rabies vaccines on this species. In total, 84 wolves were vaccinated, of which, 25 individuals were re-trapped for a booster dose. Serological analysis showed multiple vaccinations to be most effective, although single doses still returned elevated antibody levels, and the longevity of the

vaccine still needs to be assessed (Knobel *et al.*, 2008). The intervention also allowed the team to model the most effective strategies to control the spread of an outbreak, in addition to the minimum vaccination target to achieve persistence in each targeted breeding unit (Haydon *et al.*, 2006). Demographic analyses suggested that any vaccination program in wolves should aim to preserve more breeding units to minimise social disruption and facilitate recruitment and recovery of the population (Marino *et al.*, 2006). In even the smallest modelled population (n=25), vaccination coverage of 60% of wolves increased the probability of persistence to over 90% (Haydon *et al.*, 2002). These results were ultimately used to develop an emergency vaccination strategy, which would be used to vaccinate wolves in response to the rabies outbreak of 2008-09.

d) Directly vaccinate wolves as preventative measure. Oral vaccinations have been used successfully to eradicate rabies in Western Europe and much of Northern America. Oral vaccination might be the most effective means of pre-empting epizootics among Ethiopian wolves as Population Viability Analyses suggest that as little as 20-40% vaccination coverage in the wolf population would be needed to enhance overall population persistence. Oral vaccination trials are proposed to test the feasibility of this approach in the Bale Mountains. The objective of the trials is to test whether bait uptake/coverage will be sufficient, and to test the effectiveness of a genetically-modified recombinant vaccine (V-RG), subject to receiving permission to import this vaccine.

Capacity building

Building capacity within the Ethiopian conservation community is paramount to securing the future protection of natural resources within the country. EWCP is committed to providing training and education opportunities for both its own staff and the wider conservation society of Ethiopia. Since 2000 EWCP has mentored and funded four B.Sc. students, 12 Masters students, and six Ph.D. students, and has sent various EWCP and EWCA staff on international conservation courses held in countries as diverse as America, Namibia, Kenya, Bulgaria, Wales, and South Africa. The research topics covered by these degrees were varied, but all had conservation implications for the Afroalpine environment and the Ethiopian wolf. Girma Eshete, from Mekele University, measured the condition of natural resources in the Abuna Yoseph mountain range, finding out what resources people use and how, thereby identifying threats to the survival of wolves in the area and to the sustainability of people's livelihoods. Gutema Jira, from Addis Ababa University, looked at the effects of fire on rodent abundance and diversity in ericaceous habitat as a follow up to the terrible fires observed in Bale in early 2008. Abera Yilma was funded and supervised by EWCP while completing his veterinary degree from Mekele University. Abera studied the effectiveness of EWCP rabies vaccinations in kebeles surrounding the Bale Mountains National Park. His results clearly showed that the number of rabies cases in unvaccinated kebeles was much higher, often with five times as many rabies cases occurring in these villages. In vaccinated kebeles, there were no reported cases of rabies in humans, while in unvaccinated kebeles there were a total of 55 cases in the past five years. The number of dogs with rabies was also drastically reduced when they were vaccinated with 150 cases of rabies reported in dogs over the past five years in unvaccinated kebeles, compared to a total of only 20 cases in the vaccinated villages.

Meta-population management

No steps have been taken in this direction, although research has been and is currently being conducted into the genetic structure of the various wolf populations (Gottelli et al., 2004; Randall et al,. 2007, 2009).

8. Ethiopian wolf populations: Status summary dossiers

Afroalpine range	Suitable habitat (km^2)	Population estimate (wolves >1 year old)	Population status	Suitable habitat within protected areas
Simien Mountains	273	52-75 (2006) (pack observations)	stable?	200 km^2 Simien Mountains NP
Mt Guna	~20	4 (2004); 0 (2011) (pack observations)	extinct ~5 years ago	-
Mt Choke	134	-	extinct ~100 years ago	-
North Wollo	140	19-23 (2000) (habitat-based estimate)	stable?	-
South Wollo	243	16-19 (2000) (habitat-based estimate)	stable?	~20km^2 Borena Saiynt Regional Park
Guassa-Menz	112	23 (2009) (pack observations)	declined recently due to disease (~40%)	82 km^2 Guassa Community Conservation Area
Gosh Meda	20	-	extinct ~15 years ago	-
Arsi Mountains	870	54 (2009) (pack observations)	stable?	870 km^2 Arsi Mountains Regional Park
Bale Mountains	1,141	~250 (2010) (pack observations)	declining due to disease	1,100 km^2 Bale Mountains NP
Overall	**2,984 km^2**	**400 - 450**	**Declining**	**2,270 km^2**

Table 3. Summary of current status of Ethiopian wolf populations, found throughout Ethiopia.

SIMIEN MOUNTAINS, **North Gondar**

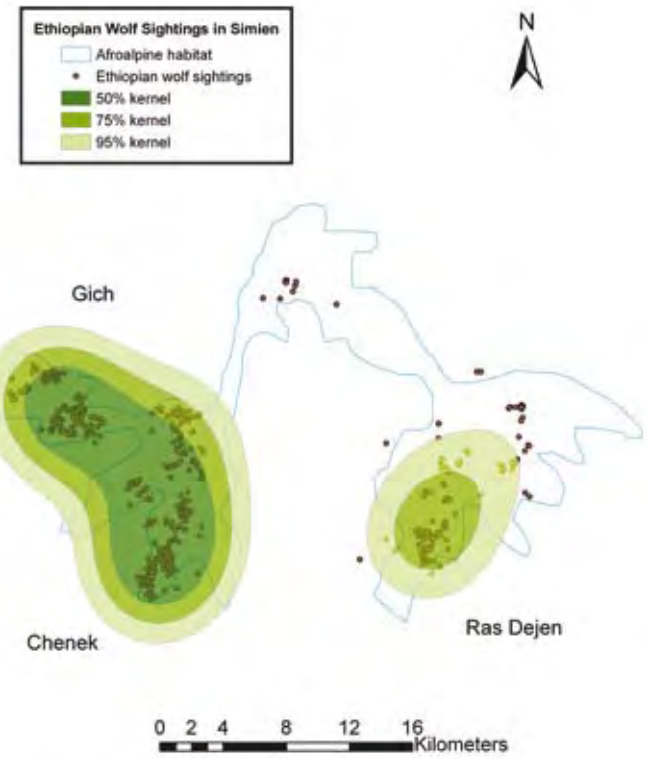
Wolf habitat:
Patches connected by corridors, totalling 273 km^2.

Population size estimates:
2000: 40-54 wolves >1 year old, habitat-based estimate
2004: 13 packs, 52-75 wolves >1 year old, from EWCP intensive pack observations, taking into account monitoring effort (EWCP)
2008/2010: 77 and 102 wolves respectively, from total counts over a few days by SMNP staff (high probability of double counting)

Population status:
Stable?

Importance:
Largest population after Bale; genetically the most diverse and with unique alleles; tourist attraction.

Wolf distribution:



Wolf ecology and behaviour:
Wolves live in groups of up to 7 adults and subadults (maximum number of adults seen together 2 males and 2 females), but more commonly 4 or less, and are rarely observed socializing in groups. Average territory size in the core wolf areas is 7.9 (SD 2.8) km2 (from 5 focal packs). Very alert to human presence, wolves react to humans by yelping and/or running away, and they use Erica stands to hide. Active mainly at dawn and dusk. Diet composed mainly of rats, including more nocturnal prey than any other population.

Monitoring intensity:
High; a priority area for EWCP/FZS monitoring and education wwrk.

Threats to wolves:
- **Human disturbance: shepherds frequently chase wolves to avoid livestock predation; current level of human disturbance may affect wolves' foraging efficiency and hence their survival. A dietary shift towards more nocturnal prey may also imply longer hours hunting and/or behavioural adaptations to avoid disturbance.**
- **Roads extensively traverse wolf range; road traffic increasing, which could lead to more road kills.**
- **Extensive agriculture encroachment at high elevation.**
- **Habitat degradation: Rodent prey patchily distributed and closely associated with swamps and small meadows; common molerat sparse. Most apparent signs of overgrazing and trampling were observed in Ayna Meda, where livestock herds are reportedly on the increase.**
- ***Helichrysum* encroachment into grassland with unknown effect on rodent prey.**
- **Diseases: few domestic dogs roaming in wolf range, but more in Ras Dejen. Known outbreaks among dogs around wolf range, but no wolf mortality reported.**
- **Jackals are seemingly common in some areas and possibly responsible for some mortality, as well as directly competing with the wolves (wolves and jackals had been observed in aggressive interactions).**

Conservation:
All wolf range in the area is now contained within the Simien Mountains National Park. EWCP/FZS monitors the population regularly since 2003, conducts education and awareness campaigns in local schools, and vaccinates dogs in response to rabies outbreaks near wolf range.

MT. GUNA,
South Gondar

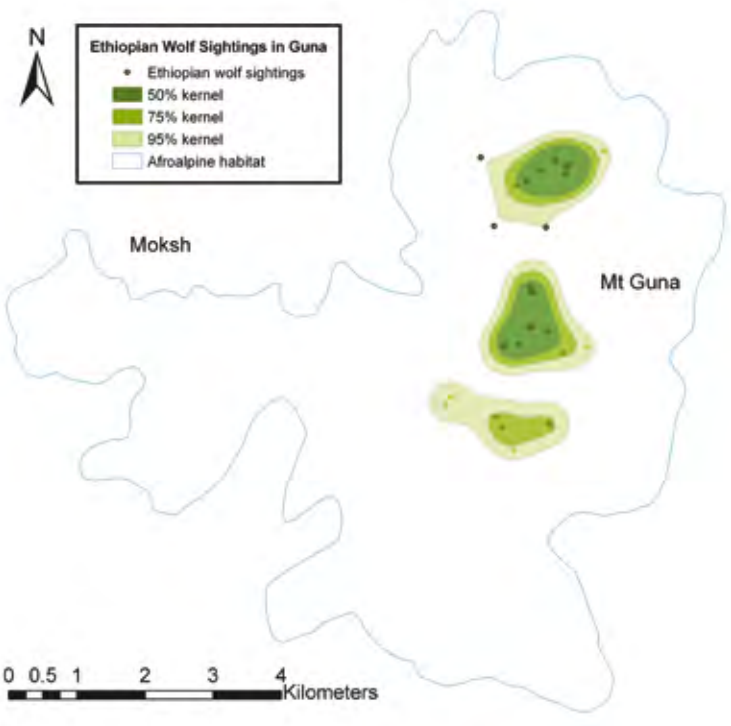
Wolf habitat:
One isolated patch; 51 km^2 in 2000 and possibly < 20km^2 by 2004

Population size estimates:
2000: 7-10 (habitat-based assessment)
2003-2004: 1 pack, largest sighting a pair with 2 juveniles in 2004 (from observations)
2011: People in Guna have not seen wolves in the last 5 years; after intensive monitoring by the EWCP team over 10 days during two field visits, no sighting or sign of Ethiopian wolf was recorded

Population status:
Extinct . Identified in 2000 as the smallest population, with highest risk of extinction

Other values:
Populations of gelada baboons, rock hyraxes; spring water

Wolf distribution:



Wolf ecology and behaviour:
Past sightings of single wolves or pairs

Monitoring intensity:
Low

Threats to wolves:
- **Small population size (vulnerable to extinction)**
- **Habitat loss: only scarce and fragmented Afroalpine habitats remain, including short grasslands and rocky outcrops; heavy encroachment in the Erica moorlands**
- **Isolation (no opportunities for recolonization)**
- **Possible competition with common jackals, relatively abundant in the area**

Conservation:
ORDA Biodiversity Conservation Project active in the area, working with regional, woreda and kebele governments to create the *Guna Protected Area,* currently demarcating the area. Guna Highland Water enterprise also supports conservation

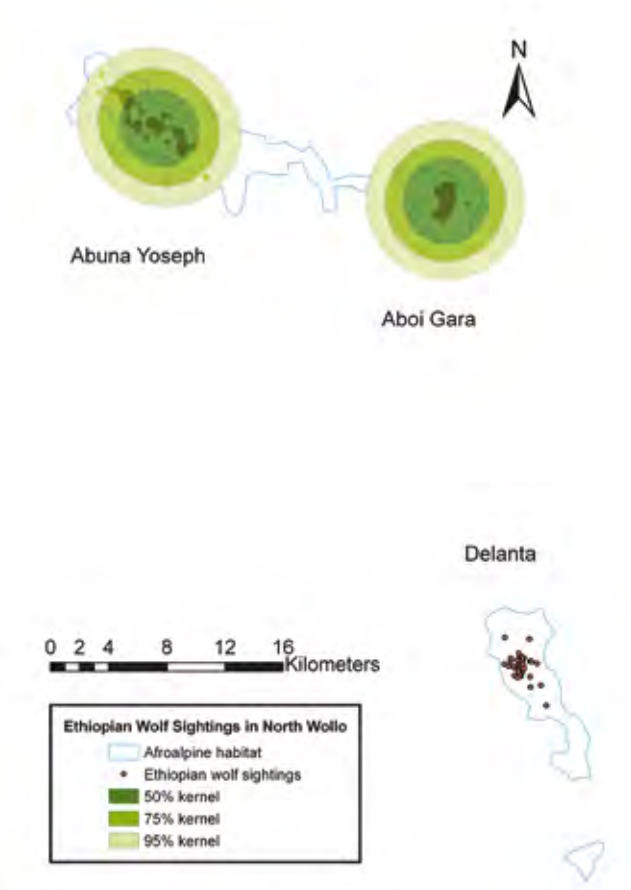
NORTH WOLLO HIGHLANDS
North Wollo

Wolf habitat: 140 km^2, patchily distributed.

Population size estimate: 19-23 (2000), habitat-based estimate.

Population status: In 1998 people reported wolves recovering from past persecution; currently the sub-population in Delanta range is seemingly declining, otherwise possibly stable.

Wolf distribution:



Importance: Potentially an important wolf population but seriously fragmented.

Other values: Increasingly viewed as a tourist attraction.

Wolf ecology and behaviour: Wolves live in groups of up to 7 adults and subadults (one sighting); sightings of 4-6 are more common. Wolves are active during the day and can be observed foraging, seemingly unafraid of people.

Monitoring intensity: Medium; Aboi Gara and Delanta are now priority areas for EWCP/FZS monitoring and education work.

Threats to wolves:

- **Fragmentation, increasing isolation among subpopulations.**
- **Habitat degradation: A combination of grasslands and charranfe are good habitats for rodents, whose signs are positively related to vegetation cover. Charranfe habitats are heavily used for firewood collection with unknown impacts on the rodent populations. In habitat transects the presence of rodent signs were negatively related to the presence of livestock signs, an indicator of grazing intensity.**
- **Human-wildlife conflict: Of 120 households at the limit of agriculture (randomly selected from within four kebeles in 2010), 90% reported having problems with wildlife due to livestock predation and crop damage (by baboons), leading to negative attitudes towards Ethiopian wolves in 30% of the people interviewed. Currently, 38% of the people report killing, trapping or poisoning wildlife to minimize damage, and 33% use dogs to deter wildlife, with the imminent risk of rabies transmission to wolves.**
- **Reportedly persecution in the past associated with population declines, but no indication of further persecution.**
- **Road traversing wolf range.**

Conservation: Currently FZS and partners are working towards the creation of the Abuna Yoseph Community Conservation Area, which would include around a third of the wolf range in North Wollo. In Aboi Gara, local communities are protecting an area of guassa grassland.

Of 120 households living next to wolf range, 34% reported a positive attitude towards wolves and 60% believed that wolves and people can coexist. A substantial proportion of people (71%) perceived a need for the conservation of natural resources in North Wollo, as they recognize that the vegetation is degrading (63%) and wildlife species are in decline (63%); the majority (91%) advocate for community-led rather than government-led conservation.

SOUTH WOLLO HIGHLANDS
South Wollo

Wolf habitat: Patches connected by corridors, totalling 243 km^2.

Population size estimate:
16-19 (2000), habitat-based estimate.

Population status: Stable?; wolves locally extinct in the Guguftu range in 2000 but now reportedly using this area again in 2010.

Importance: Second largest Afroalpine area north of the Rift Valley, after Simien.

Other values: Remnants of Erica forests and healthy Guassa grasslands in the Denkoro range.

Wolf ecology and behaviour: wolves observed in groups of up to 7 adults and subadults (one sighting only); sightings of 4-6 are more common.

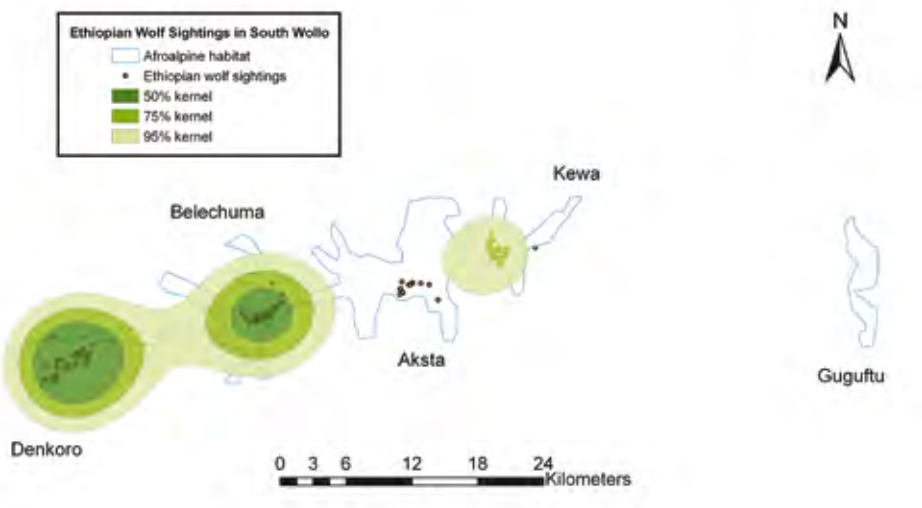
Monitoring intensity: low; now Kewa and Guguftu are priority areas for EWCP/FZS monitoring and education work.

Threats to wolves:

- **Habitat degradation due to grazing.**
- **Commercial sheep farm established in a small patch of suitable habitat in Guguftu, partly ploughed for the cultivation of pasture.**
- **Persecution in the past reportedly associated with the extinction of wolves in Guguftu.**
- **Some negative attitudes among locals because of livestock predation, but only a third reported livestock losses to wolves; spotted hyenas were considered the main predators in all areas.**

Conservation: The Denkoro State Forest, now Borena Saiynt Regional Park, protects ericaceous forests and grasslands from agriculture expansion as low as 3,200m. EWCP and FZS have been involved in education and wolf monitoring in Denkoro area.

Wolf distribution:



GUASSA-MENZ, North Shoa

Wolf habitat:
112 km², a single patch.

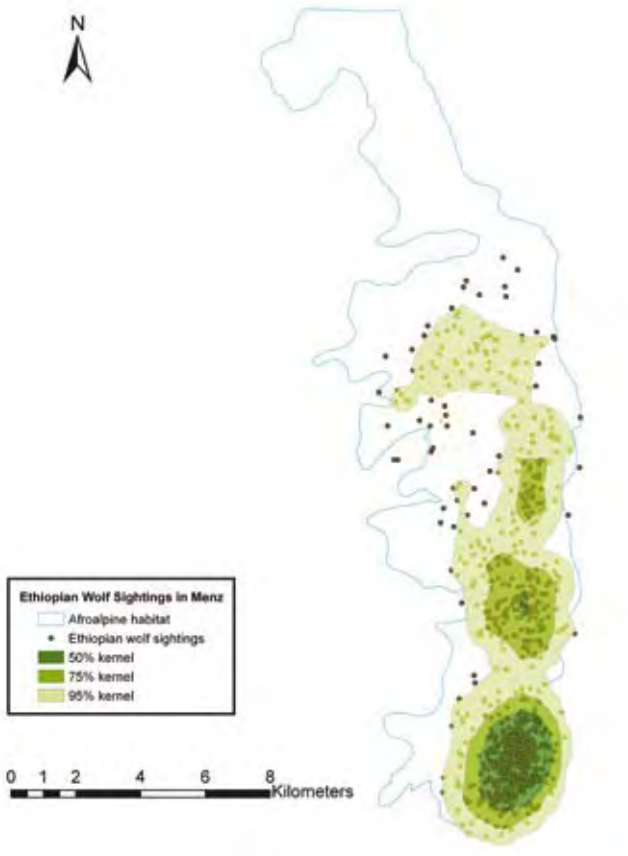
Population size estimate:
2000: 17-23 adult and subadult wolves (habitat-based estimate)
2004: 21±5 individuals (from wolf observations)
2009: 23 wolves from DNA fingerprinting
2010: several wolf carcasses found and CDV outbreaks detected in domestic dogs; all packs still present but an estimated 40% of wolves missing.

Population status:
A healthy, stable population; but currently diminishing due to disease.

Importance:
A core wolf population; high density of animals in good quality habitat.

Other values:
Important population of gelada baboons; Guassa grasslands an important resource for local communities; increasingly a tourist attraction.

Wolf distribution:



Wolf ecology and behaviour:
Ethiopian wolves in Guassa live at lower density (0.2±0.05/km²) than in the Bale Mountains, but without significant differences in mean territory size. Packs comprise between 4 and 9 adults and sub-adults, with a mean pack size of 5.7(SD 0.25), and their annual territories range from 5.5 to 9.2 km², mean 7.2 (SD 0.8) km². Giant molerats (*Tachyoryctes macrocephalus*), the main prey of wolves in Bale, are largely replaced in the diet by common molerats (*T. splendens*).

Monitoring intensity:
High

Threats to wolves:
- **Disturbance: Ethiopian wolves in Guassa do show alarm responses when at close distances to people, but not to cattle, and in both cases their activities changed very little. Ethiopian wolves associate with cattle as long as cattle herders do not chase them, but sheep flocks are closely guarded and wolves are invariably chased away.**
- **Rabies present among domestic dogs living close to the wolf range.**
- ***Helichrysum* encroachment into grassland with unknown effect on rodent prey.**
- **Road kills.**

Conservation:
Wolf ranges protected by community-based resource management practices and the imminent creation of the Guassa Community Conservation Area. Environmental education campaigns among schools near wolf range.

ARSI MOUNTAINS, **Bale**

Wolf habitat: 870 km^2, mainland-island structure.

Population size estimate:
2000: 93-108 adult and subadult wolves (habitat-based estimate)
2007-2010: 54 wolves in 9 packs (from pack observations)

Population status: Possibly declining, although monitoring efforts have decreased since 2009.

Importance: The second largest Afroalpine area in Ethiopia, and third largest wolf population.

Other values: Important populations of endemic ungulates; extensive Erica moorlands.

Wolf ecology and behaviour: Wolves live in groups and are active during the day. Common molerats are an important prey.

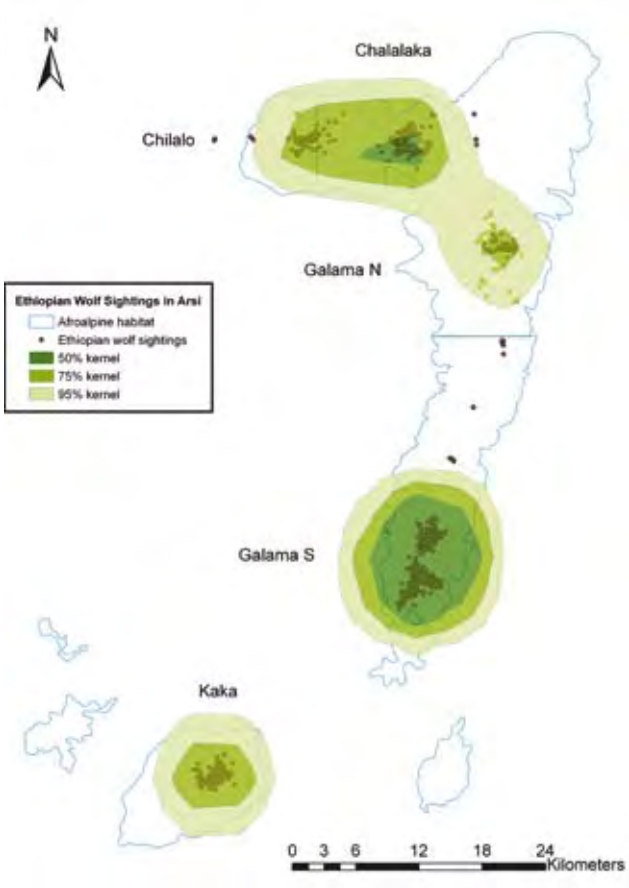
Monitoring intensity: Medium (high in 2007 -2009).

Threats to wolves:

- **Habitat degradation: fires, grazing, Erica harvesting.**
- **Habitat loss from expanding agriculture.**
- **Some wolf persecution in the recent past.**
- **A road traverses wolf range.**

Conservation: Now protected within the Arsi Mountains Regional Park, created in 2011. The Oromia Forest and Wildlife Enterprise worked with local governments and EWCP to demarcate the boundaries. EWCP has conducted environmental education campaigns and community outreach work in the area since 2004.

Wolf distribution:



BALE MOUNTAINS, **Bale**

Wolf habitat:
1,141 km^2, mainland-island.

Population size estimate:
~250 adult and subadult wolves; wolf numbers change as local populations are affected by epizootics.

Population status:
stable in the long-term, but currently declining.

Importance:
the largest wolf population, with highest densities of prey and wolves.

Other values:
important populations of the endangered mountain nyala and the Bale-endemic giant molerat, high tourism value.

Monitoring intensity:
highest.

Wolf ecology and behaviour:
large social groups; giant molerat main prey; largely indifferent to people.

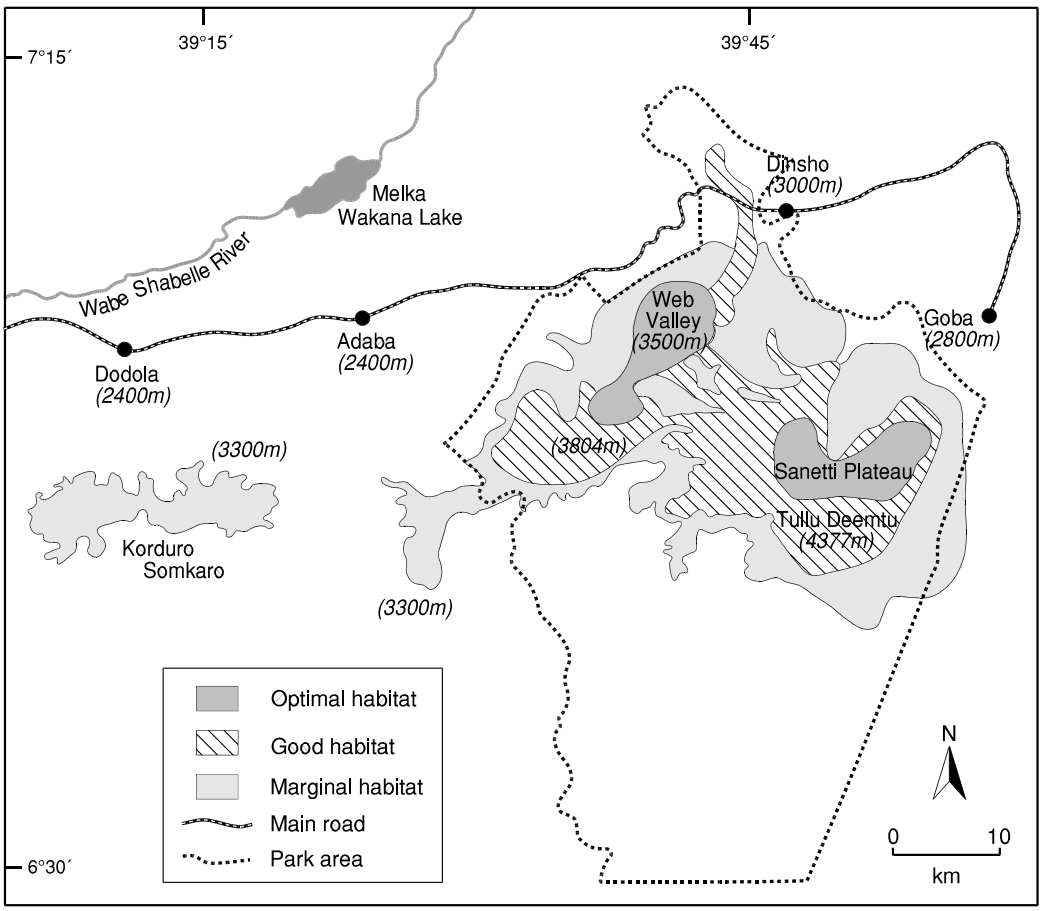
Threats to wolves:

- **Diseases, mainly rabies, but also canine distemper virus, have decimated local populations living at high density (Web Valley, Sanetti, Morabawa). These populations invariably bounce back, but recovery can be slow, particularly if there is further mortality or consecutive outbreaks as witnessed with the canine distemper outbreak of 2010, following on from the rabies epidemic of 2008/09.**

- **Recently, agriculture encroachment.**

Conservation:
Most wolf habitat within Bale Mountains National Park. EWCP has worked in Bale since 1995 to protect wolves mainly through education, research, disease control and intensive monitoring. FZS stationed in the National Park to build capacity and strengthen Park operations.

Wolf distribution:



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Part Two:

Strategic Planning Process for Ethiopian Wolf Conservation

Part Two: Strategic Planning process for Ethiopian Wolf Conservation

The drafting of a national action plan for Ethiopian wolf conservation took place over two days, at a workshop attended by a broad range of participants from both non-governmental and governmental agencies, as well as community representatives and members of international conservation bodies. The planning process followed closely the IUCN/SSC guidelines for species conservation strategic planning[1]. Indeed, this is one of the first strategic plans prepared adhering to the approach proposed by this timely and useful handbook.

The meeting started with an overview of the Ethiopian wolf, its status, distribution, ecological requirements, and the threats it faces. Relatively in-depth and long-term data exists on the larger populations of Ethiopian wolves found in Bale, Arsi and Simien, although the most reliable data comes from the Bale Mountains in southern Ethiopia, where the Ethiopian Wolf Conservation Programme (EWCP) has been operating for the past 16 years. Participants were invited to give their feedback on the status review, providing additional information where it was missing, or advocating changes where they felt necessary.

Vision

Following on from the status review, the facilitator explained the strategic planning process, and the various steps to be followed in order to achieve the desired outcome. Group discussions started with the drafting of a Vision statement, a description of the participants' collective wish for the future state of the species. According to IUCN guidelines, the Vision should broadly describe the desired range and abundance for the species, its ecological role, and its relationship with humans. After all the participants had given their input towards a broad Vision statement by presenting their hopes for successful Ethiopian wolf conservation, a drafting group was given the task of refining this statement. The group then presented the refined Vision statement to all participants for further input. This process was repeated until a final Vision statement was developed that was acceptable to everyone.

To secure viable and ecologically functioning Ethiopian wolf populations and habitats across their present distribution, to extend the species presence to suitable ranges, and to emphasise its role as a flagship for the conservation and sustainable use of the Afroalpine ecosystem and biodiversity, on which present and future generations of Ethiopians also depend."

1- IUCN/ Species Survival Commission. 2008. *Strategic Planning for Species Conservation: A Handbook.* Version 1.0. IUCN Species Survival Commission, Gland, Switzerland, 104pp.
http://www.cbsg.org/cbsg/content/files/scptf_handbook.pdf

Young male Ethiopian wolf, Bale Mountains (©A. Stewart).

Goals

Drafting of the Vision was then followed by the development of targeted Goals to work towards over the next 10 years. These Goals are a rephrasing of the vision in operational terms, to capture in greater detail what needs to be achieved, and where, to save the species. The Vision statement was broken down into its various components, so that each Goal could be designed to meet or fulfil a specific component. Both the Vision and the Goals had the same geographical and temporal scale, with the goals ascribing to the SMART philosophy – Specific, Measurable, Achievable, Realistic, and Time-bound. The participants then broke into groups to further refine the six Goals.

1. All existing Ethiopian wolf populations secured, not at risk of immediate extinction, with genetic diversity maintained, and the number of wolf packs increased.

2. Ethiopian wolves actively managed as a metapopulation, including wherever possible the restoration of wolves to available habitat within their historical range.

3. Afroalpine habitats protected from further degradation, conserved, and restored.

4. Coexistence of wolves, people and their livestock fostered throughout the species' range.

5. All stakeholders, especially decision makers at the national, regional, and local levels, involved in, and committed to conserving wolves and their habitat.

6. Mechanisms developed to fairly share, across generations, the costs and benefits of wolf and Afroalpine conservation.

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Objectives

The next step in the action plan process was the development of Objectives in order to meet the Goals over a specific timeframe. While the Vision and Goals describe a future scenario for Ethiopian wolf conservation that the participants want to work towards, the Objectives outline how this will be achieved. IUCN guidelines state the Objectives should be clear, understandable and realistic, and should allow Actions to follow on from them.

The facilitator then explained that one effective way of deciding on the various Objectives for each Goal is to first conduct a threat analysis. While many of the threats to Ethiopian wolves were already identified in the status review earlier in the meeting, other constraints to be included in the threat analysis were those which might hamper mitigation of those initial threats, such as lack of policy and a lack of resources.

As identified in the Status Review, the main threats affecting Ethiopian wolves are loss of habitat and prey, disease, and persecution, which are directly linked to growing human populations and the resultant expansion of settlements and agriculture into Ethiopian wolf range. These main threats were agreed on by all participants. The process of constructing a threat tree for the wolves (Fig x) then allowed participants at the workshop to consolidate the various threats and identify their primary causes, which were then narrowed down to just five key drivers, namely: increasing human populations, poor land planning, a lack of resources, the fact that environmental issues are not a priority, and poverty issues.

The threat tree provided a useful and very visual framework for considering which components of the network of threats and constraints could be most easily and effectively addressed with logical and achievable Objectives, and achieved with implementable Actions.

Actions

The participants then broke into smaller groups, with each group tackling two Goals and developing their related Objectives. The formation of Objectives under each goal was then followed by the listing of numerous Actions.

These Actions are the activities that need to be performed in order to achieve the Objectives, Goals, and, ultimately, the Vision for Ethiopian wolf conservation. Each Action is associated with a time frame, as well as the human and financial resources potentially needed to achieve that specific Action. Each Action is also assigned to various suitable organisations or bodies that will carry out the activity, while one single entity is ultimately accountable for ensuring that the Action is achieved, and preferably within the given time frame. The actions have also been distinguished in terms of their priority for Ethiopian wolf conservation; high, medium or low, signified by an appropriately labelled box next to the specific action.

After the various groups had drafted their Objectives and Actions, they presented their efforts to the rest of the participants in order to gain feedback and to further refine this part of the strategic planning process. At the end of the two-day workshop, a draft action plan for Ethiopian wolf conservation had been developed through the contributions, efforts and dedication of all participants at the meeting. The National Action Plan presented here benefitted from a thorough revision process involving all workshop participants.

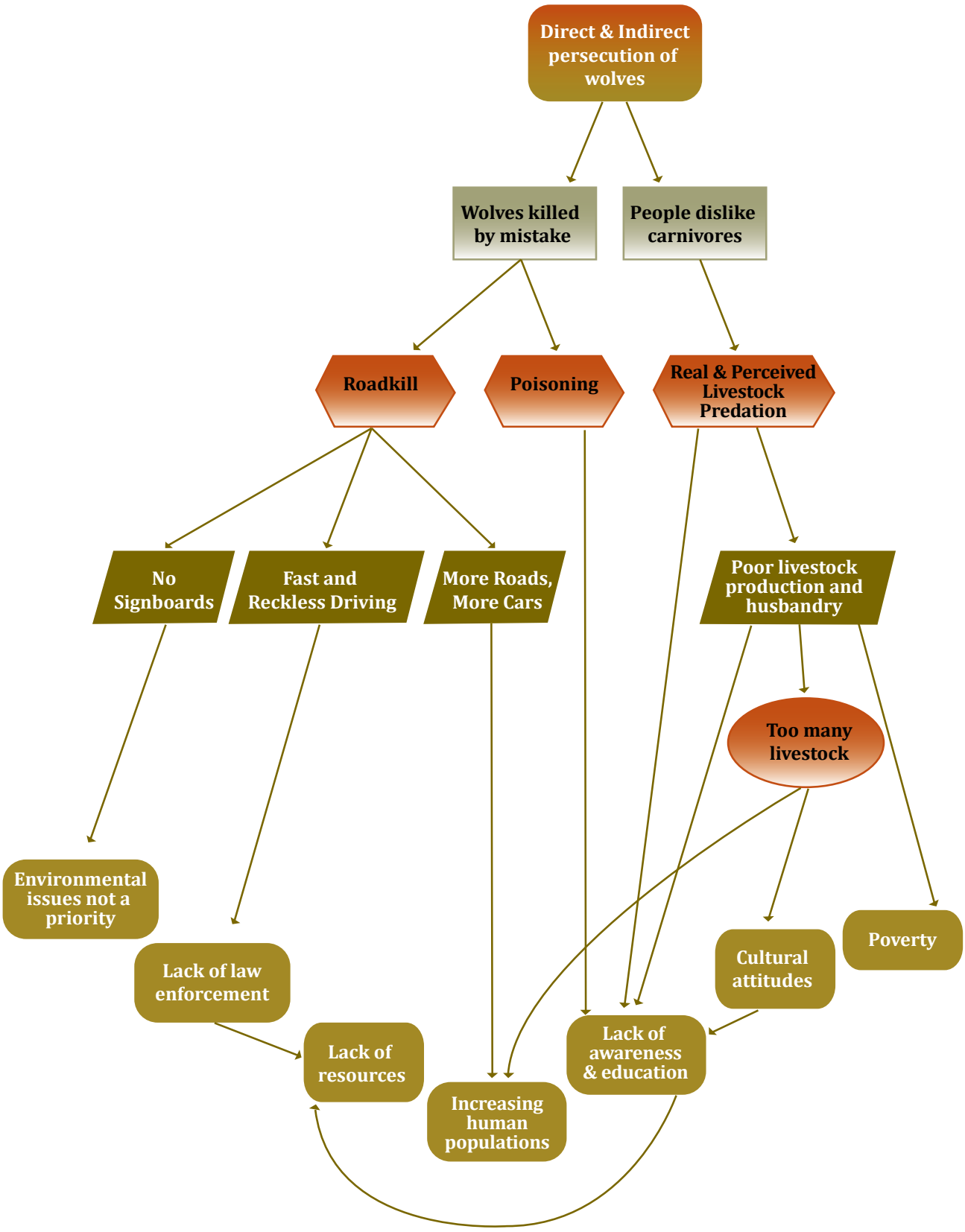

Figure 16. Threat tree for Ethiopian wolves.

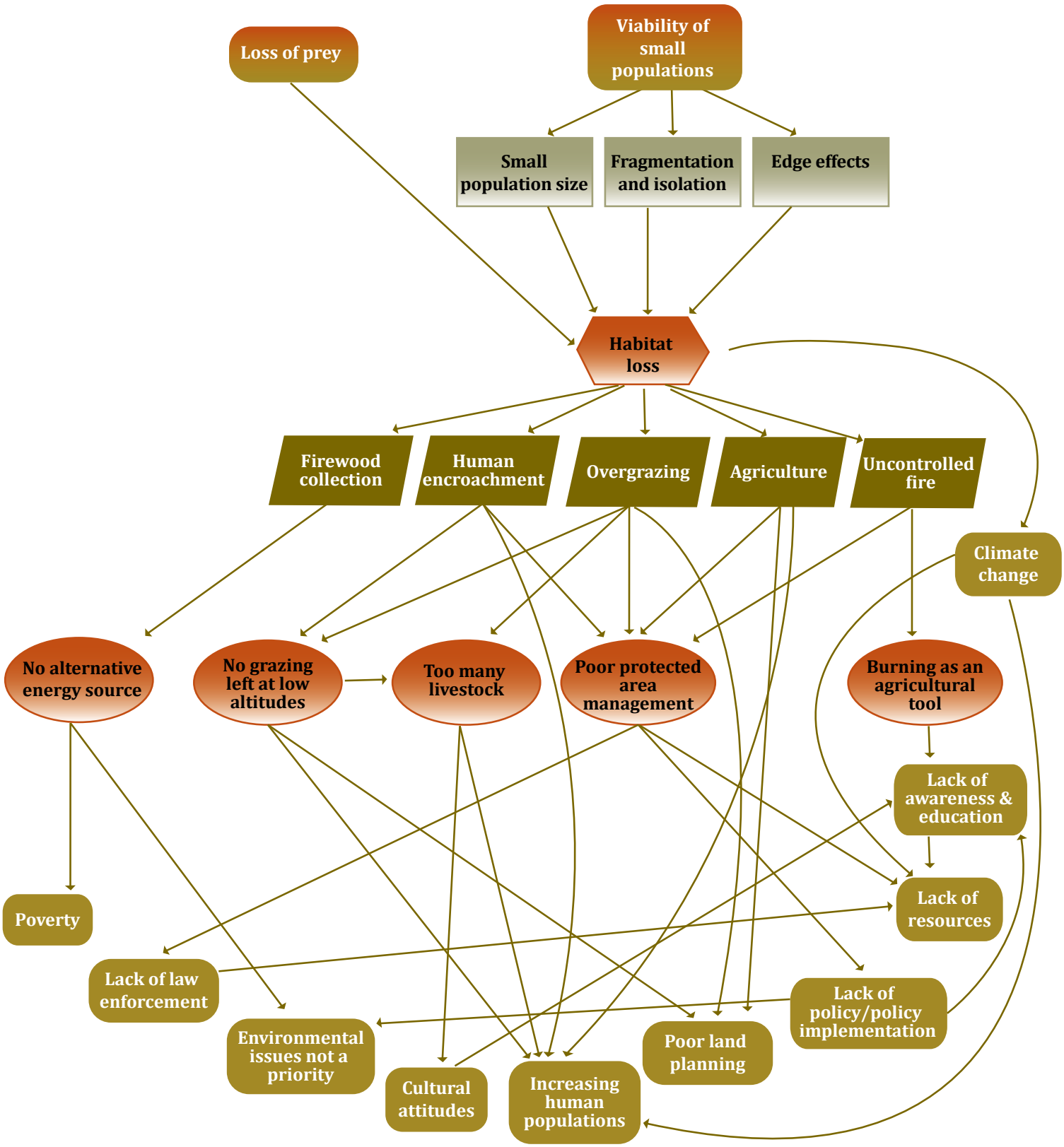

Figure 16 (cont.). Threat tree for Ethiopian wolves.

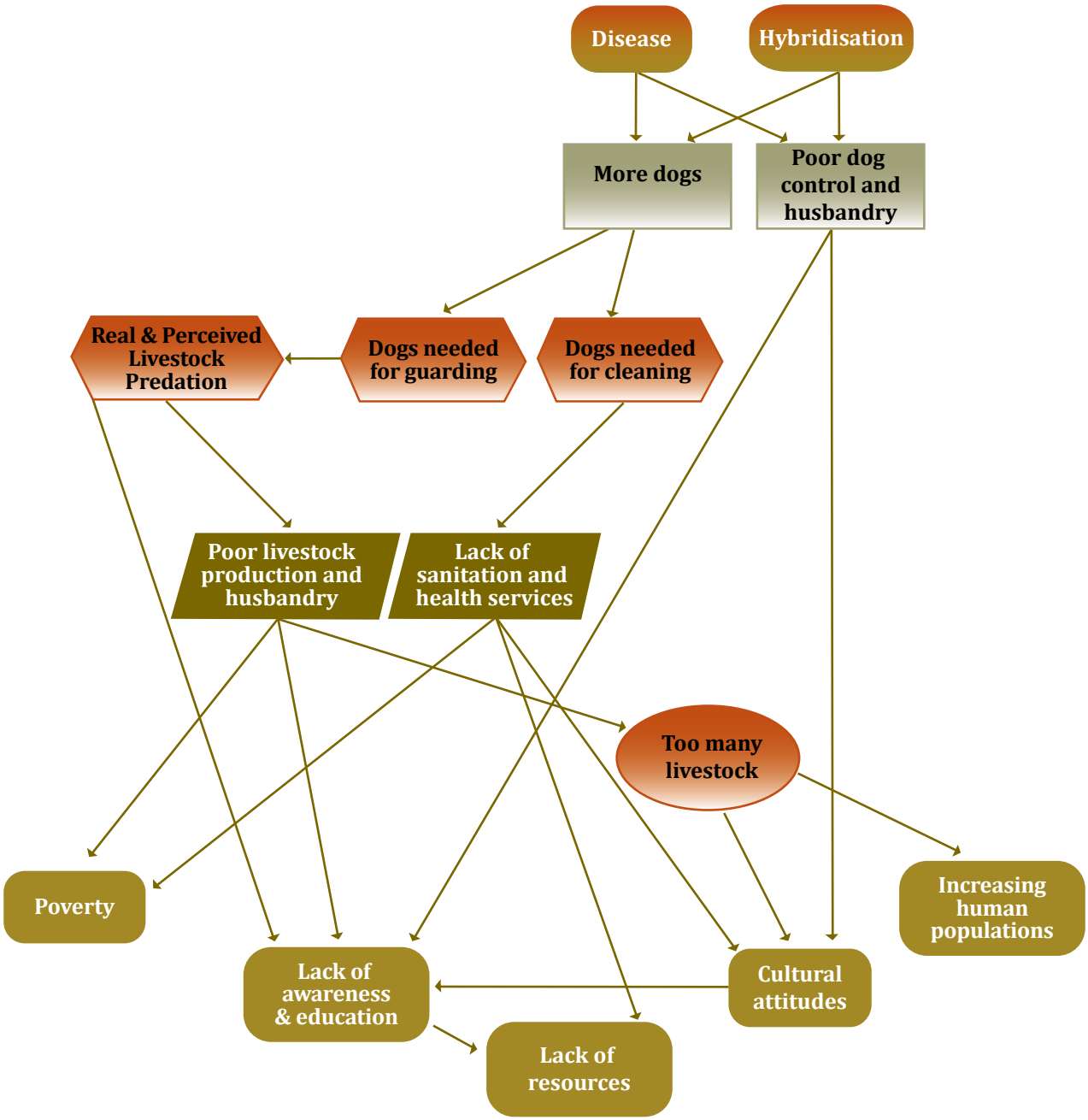

Figure 16 (cont.). Threat tree for Ethiopian wolves.

Part Three:

National Action Plan for the Conservation of the Ethiopian Wolf

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National Action Plan
Based on a workshop held in Lalibela
22 – 24 February 2011
Published by EWCA, November 2011

Recommended citation: Ethiopian Wildlife Conservation Authority. 2011. National Action Plan for the Conservation of the Ethiopian Wolf. EWCA, Addis Ababa.

Part Three: National Action Plan for the Conservation of the Ethiopian Wolf

Compiled by the Lalibela Drafting Group for endorsement by the Ethiopian Wildlife Conservation Authority.

Vision

"To secure viable and ecologically functioning Ethiopian wolf populations and habitats across their present distribution, to extend the species presence to suitable ranges, and to emphasise its role as a flagship for the conservation and sustainable use of the Afroalpine ecosystem and biodiversity, on which present and future generations of Ethiopians also depend."

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Goals:

1. All existing Ethiopian wolf populations secured, not at risk of immediate extinction, with genetic diversity maintained, and the number of wolf packs increased.

2. Ethiopian wolves actively managed as a metapopulation, including wherever possible the restoration of wolves to available habitat within their historical range.

3. Afroalpine habitats protected from further degradation, conserved, and restored.

4. Coexistence of wolves, people and their livestock fostered throughout the species' range

5. All stakeholders, especially decision makers at the national, regional, and local levels, involved in, and committed to conserving wolves and their habitat

6. Mechanisms developed to fairly share, across generations, the costs and benefits of wolf and Afroalpine conservation

For each action an indication of resources needed is provided. These can include manpower, equipment, and financial input. All monetary figures quoted are in US Dollars. An indicator of success will allow the organisation accountable to determine whether the objective has been achieved.

Objectives and Actions linked to specific goals:

GOAL 1. *All existing Ethiopian wolf populations secured, not at risk of immediate extinction, with genetic diversity maintained, and the number of wolf packs increased.*

OBJECTIVE 1.1: To have the information available to detect changes of status and threats in all populations (baseline in place within 1 - 3 years).

1.1.1. Action: ***Monitor trends in all wolf populations (regularly), including more intensive monitoring presence in lesser known populations.*** *High*

Timeline: Immediate; continuing.
Actors: EWCP; FZS; PA managers; CCA monitors.
Accountability: EWCA.
Resources needed: $ 30,000 per year. EWCP wolf monitors and ambassadors; FZS para-ecologists.
Indicator of success: Population trends (indices); annual population figures and rates of change.

1.1.2. Action: ***Collate available information on threats (including rates of change) from existing protected area monitoring systems.*** *Medium*

Timeline: Baseline by Month 6; continuing annually.
Actors: EWCP; FZS; PA managers; CCA monitors.
Accountability: EWCA.
Resources needed: EWCP one person for one week annually.
Indicator of success: Data collated into a database.

1.1.3. Action: ***Monitor threats in all populations both inside and outside protected areas.*** *High*
Timeline: Immediate; continuing.

Actors: EWCP; FZS; PA managers; CCA monitors; Kebele personnel.
Accountability: EWCA.
Resources needed: $ 5,000 per year. EWCP wolf monitors; FZS para-ecologists; CCA monitors; PA scouts; EWCP education officers.
Indicator of Success: Regular, reliable information from each site available; early detection of epizootics and any sudden threats.

OBJECTIVE 1.2: To reduce dog populations living in or using wolf habitat by: a) 80% within 5 years in National and Regional Parks; b) 30% within 5 years in unprotected areas.

1.2.1. Action: ***Develop and implement settlement management plans for protected areas.*** *High*

Timeline: Year 2 – 5; ongoing.
Actors: National and Regional PA authorities.
Accountability: National and Regional PA authorities.
Resources needed: $ unknown. National and Regional PA personnel.
Indicator of success: Completed management plan; People resettled.

1.2.2. Action: ***In remaining settlements in protected areas, ensure that settlement management plan includes a clause that no dogs are allowed in settlements.*** *High*

Timeline: Year 2.
Actors: National and Regional PA authorities.
Accountability: National and Regional PA authorities.
Resources needed: EWCP; FZS personnel.
Indicator of success: Clause(s) included in the document.

1.2.3. Action: ***Ensure no dogs are allowed in any remaining settlements in protected areas through education, and implementation of humane dog control policy.*** *High*

Timeline: Year 5; ongoing.
Actors: PA authorities; Local woredas.
Accountability: National and Regional PA authorities; BoA.
Resources needed: $ 10,000 per year. Education and enforcement personnel.
Indicator of success: 80% less dogs in settlements inside protected areas.

1.2.4. Action: ***In unprotected areas, implement education programmes to reduce the number of free ranging dogs accompanying livestock.*** *Medium*

Timeline: Year 1; ongoing.
Actors: EWCP; BoA; Other NGOs.
Accountability: EWCP.
Resources needed: $ 10,000 Education and agricultural officers.
Indicator of success: 30% less dogs.

1.2.5. Action: ***In unprotected areas, develop livestock management tools and improved sanitation to reduce need for dogs.*** *Medium*

Timeline: Year 2 – 5; ongoing.
Actors: EWCP; BoA; Other NGOs.
Accountability: EWCP.
Resources needed: $ 10,000 for pilot/demonstration site. Outreach and agricultural officers; Ministry of Health.
Indicator of success: 30% less dogs in the demonstration site.

OBJECTIVE 1.3: a) To reduce the incidence of rabies in small and medium wolf populations to zero (no outbreaks) within 5 - 12 years, and b) To ensure no losses of breeding units within large wolf populations from rabies within 5 - 12 years.

1.3.1. Action: ***Test feasibility, safety and efficacy of oral rabies vaccines in wolves.*** *High*

Timeline: Year 1.
Actors: EWCP; EWCA; MoARD; EPA; IBD.
Accountability: EWCA; EWCP.
Resources needed: $ 40,000
Researcher; Capture team.
Indicator of success: Test results analysed and available.

1.3.2. Action: *Develop rabies management plan, based on trial results.* *High*

Timeline: Year 1.5.
Actors: EWCP; EWCA; BoA; PA managers.
Accountability: EWCA; EWCP.
Resources needed: $5,000 EWCP; EWCA; BoA; PA managers.
Indicator of success: Plan developed.

1.3.3. Action: *Implement rabies management plan, with priority in smaller populations.* *High*

Timeline: Year 2.
Actors: EWCA; EWCP; PA managers.
Accountability: EWCA; EWCP; Regional PA authorities.
Resources needed: $ 30,000 per year. EWCP personnel.
Indicator of success: No rabies outbreak in small populations in years 5 – 12, (and/or no breeding units lost).

1.3.4. Action: *Continue to vaccinate dogs living in wolf habitats in Bale Mountains (until rabies management plan is operational).* *High*

Timeline: Immediate in priority areas (e.g. Bale Mountains).
Actors: EWCA; EWCP; PA managers.
Accountability: EWCP.
Resources needed: $ 30,000 per year. EWCP vet team.
Indicator of success: No rabies outbreak in wolves in years 5 – 12, (and/or no breeding units lost).

1.3.5. Action: *Emergency response using parenteral vaccination in wolves, if and when an epizootic is detected.* *High*

Timeline: As required.
Actors: EWCP; EWCA; FZS.
Accountability: EWCA; EWCP.
Resources needed: $ 15,000 EWCP vet team; EWCA vet.
Indicator of success: Target 40% of affected population inoculated (up to 60% for small populations).

OBJECTIVE 1.4: a) All tools to prevent or control outbreaks of canine distemper virus (CDV) in wolves are available within 5 years, and b) To reduce the incidence of canine distemper virus in all wolf populations to zero within 7 - 15 years.

1.4.1. Action: *Trial injectable CDV vaccines in Ethiopian wolves for safety and efficacy.* *High*

Timeline: Year 1.
Actors: EWCP; EWCA; MoARD.
Accountability: EWCA; EWCP.
Resources needed: $ 10,000 Researcher; Capture team.
Indicator of success: Test results analysed and available.

1.4.2. Action: ***Investigate feasibility, safety and efficacy of oral CDV vaccines in Ethiopian wolves.*** *High*

Timeline: Year 3.
Actors: EWCP; EWCA; MoARD; EPA; IBD.
Accountability: EWCA; EWCP.
Resources needed: $ 30,000 Researcher; Capture team.
Indicator of success: Test results analysed and available.

1.4.3. Action: ***Develop CDV management plan, based on trial results.*** *High*

Timeline: Year 3.5.
Actors: EWCP; EWCA; BoA; PA managers.
Accountability: EWCA; EWCP.
Resources needed: $ 5,000 EWCP; EWCA; BoA; PA managers.
Indicator of success: Plan developed.

1.4.4. Action: ***Implement CDV management plan, with priority in smaller populations.*** *High*

Timeline: Year 4.
Actors: EWCA; EWCP; PA managers.
Accountability: EWCA; EWCP; Regional PA authorities.
Resources needed: $ 30,000 per year. EWCP personnel.
Indicator of success: No CDV outbreak in wolves in years 7 – 15.

1.4.5. Action: ***Vaccinate dogs living in wolf habitats against CDV (until CDV management plan is operational).*** *High*

Timeline: Immediate in priority areas (e.g. Bale Mountains).
Actors: EWCA; EWCP; BoA.
Accountability: EWCP.
Resources needed: $ 24,000 per year. EWCP vet team.
Indicator of success: No CDV outbreak in wolves in years 7 – 15.

OBJECTIVE 1.5: To conduct research within 5-7 years on the behavioural and ecological impacts of disturbance and competition in Ethiopian wolves [a) the ecological relationships between Ethiopian wolves and other species (particularly jackals), b) the effect of human disturbance (presence) on Ethiopian wolf behaviour.]

1.5.1. Action: ***Research on wolf-jackal interactions in North Ethiopian populations.*** *Low*

Timeline: Year 2.
Actors: EWCP; Ethiopian Universities.
Accountability: EWCP.
Resources needed: $ 2,000. 1 Masters student.
Indicator of success: Understand the relationship between wolves and jackals.

1.5.2. Action: ***Research on effect of human disturbance on wolf behaviour and survival.*** *Medium*

Timeline: Year 2.
Actors: EWCP; Ethiopian Universities.
Accountability: EWCP.
Resources needed: $ 4,000 1 or 2 Masters students.
Indicator of success: Understand the behavioural changes of wolves caused by human disturbance.

OBJECTIVE 1.6: To enforce legislation against wolf killings.

1.6.1. Action: ***Review relevant legislation on illegal killing of wildlife.*** *Medium*
Timeline: Year 1.
Actors: EWCP.
Accountability: EWCP.
Resources needed: EWCP Field Director.
Indicator of success: Report Prepared.

1.6.2. Action: ***Prepare Rapid Response Protocol to deal with poisonings and wolf killings.*** *Medium*

Timeline: Year 2.
Actors: EWCP; EWCA; FZS; Law enforcement bodies.
Accountability: EWCA.
Resources needed: $ 500 EWCP Field Director; WildCRU; FZS.
Indicator of success: Final peer-reviewed document.

1.6.3. Action: ***Create awareness and knowledge of the new protocol and the repercussions.*** *Medium*

Timeline: Year 2.5.
Actors: EWCP; EWCA; FZS; PA managers.
Accountability: EWCA.
Resources needed: $ 500 Education officers.
Indicator of success: Awareness created.

1.6.4. Action: ***Enforcement of protocol when necessary.*** *Medium*

Timeline: Year 3; ongoing.
Actors: EWCA; PA Authorities; Local woredas.
Accountability: EWCA.
Resources needed: $ 500 per year. PA scouts**;** Local law enforcement.
Indicator of success: No more wolf killings.

GOAL 2. *Ethiopian wolves actively managed as a metapopulation, including wherever possible the restoration of wolves to available habitat within their historical range.*

OBJECTIVE 2.1: To maintain Ethiopian wolf genetic variability and structure.

2.1.1. Action: ***Systematic EW faecal sample collection across all populations to enable a genetic study.*** *Medium*

Timeline: Year 1; ongoing.
Actors: EWCP; ZSL; FZS.
Accountability: EWCP.
Resources needed: $ 2,000 EWCP wolf monitors; FZS para-ecologists; CCA monitors.
Indicator of success: Adequate sample sizes for all populations delivered to lab.

2.1.2. Action: ***Expand research on nuclear DNA to establish genetic monitoring of all*** *Medium*
populations, particularly the ones surviving in isolated patches, in order to define intra-specific levels of genetic divergence.

Timeline: Year 2.
Actors: ZSL; WildCRU; EWCP.
Accountability: WildCRU.
Resources needed: $ 10,000 Institute of Zoology lab (Dada Gottelli).
Indicator of success: Peer-reviewed publication.

OBJECTIVE 2.2: To establish a metapopulation management plan to enhance the viability of Ethiopian wolf populations within 3 – 5 years.

2.2.1. Action: ***Estimate the population size and/or carrying capacity for each Afroalpine range.*** *High*

Timeline: Year 2.
Actors: EWCP; FZS; WildCRU.
Accountability: WildCRU.
Resources needed: $ 5,000 EWCP monitors; FZS para-ecologists; WildCRU (Researcher; Modeller).
Indicator of success: Report circulated.

2.2.2. Action: ***Using data from objective 1.1, develop a metapopulation management plan.*** *Medium*

Timeline: Year 4.
Actors: EWCP; EWCA; FZS; WildCRU.
Accountability: EWCA.
Resources needed: $ 5,000 EWCP; EWCA: FZS: WildCRU.
Indicator of success: Plan distributed.

OBJECTIVE 2.3: To explore the feasibility, and to identify potential sites, for translocation and/or reintroduction of Ethiopian wolves within their historical range within five years.

2.3.1. Action: ***Visit Mt Choke to evaluate habitat quality, threats and suitability for reintroduction of Ethiopian wolves***. *Medium*

Timeline: Year 2.
Actors: EWCP; FZS; Relevant Regional body.
Accountability: EWCP; EWCA.
Resources needed: $ 3,000 EWCP monitors; FZS para-ecologists; WildCRU.
Indicator of success: Report prepared.

2.3.2. Action: ***Model effect of supplementation and reintroductions on population size and persistence.*** *Medium*

Timeline: Year 3.
Actors: WildCRU; Glasgow University.
Accountability: EWCP; EWCA.
Resources needed: $ 3,000 WildCRU; Dan Haydon.
Indicator of success: Peer-reviewed publication.

2.3.3. Action: ***Develop movement and release protocol for Ethiopian wolves.*** *Medium*

Timeline: Year 3.
Actors: EWCP; EWCA.
Accountability: EWCP; EWCA.
Resources needed: EWCP; EWCA.
Indicator of success: Protocol developed.

2.3.4. Action: ***Translocate/reintroduce wolves as per metapopulation management plan to at least one site within 10 years, if site is feasible.*** *Medium*

Timeline: Year 5.
Actors: EWCP; FZS; Relevant Regional body.
Accountability: EWCP; EWCA.
Resources needed: $ 50,000 EWCP; EWCA.
Indicator of success: Wolves released; at least one breeding unit established.

OBJECTIVE 2.4: To collect and safely preserve genetic material of Ethiopian wolves (cryo-preservation) within 3 years to contribute to the future metapopulation management.

2.4.1. Action: ***Pilot collection of Ethiopian wolf semen.*** *Medium*

Timeline: Year 1.
Actors: EWCP; EWCA; FVM; WildCRU; IBREAM.
Accountability: EWCA.
Resources needed: $ 15,000 EWCP; EWCA; FVM; WildCRU; IBREAM.
Indicator of success: Healthy samples stored.

2.4.2. Action: ***Develop semen storage protocol.*** *Medium*

Timeline: Year 1.
Actors: EWCP; FVM; IBREAM.
Accountability: EWCA.
Resources needed: $ 500 EWCP; FVM; IBREAM.
Indicator of success: Protocol peer-reviewed, published and distributed.

2.4.3. Action: ***Achieve long-term semen storage.*** *Medium*

Timeline: Year 1; ongoing.
Actors: IBD; FVM; EWCA.
Accountability: EWCA.
Resources needed: $ 500 per year. IBD; FVM.
Indicator of success: Viable samples after thawing.

OBJECTIVE 2.5: To provide a suitable protocol to handle any individual Ethiopian wolf rescue due to either injury or illegal trade within 2 years.

2.5.1. Action: ***Review existing regulations for rescuing/homing wild animals in Ethiopia.*** *Medium*

Timeline: Year 1.
Actors: EWCP; EWCA; BFF-ET.
Accountability: EWCA.
Resources needed: EWCP; BFF-ET personnel.
Indicator of success: Short Report.

2.5.2. Action: ***Secure agreement with wildlife care centre.*** *Medium*

Timeline: Year 1.
Actors: EWCP; EWCA; BFF-ET.
Accountability: EWCA.
Resources needed: EWCP; BFF-ET personnel.
Indicator of success: Agreement signed.

2.5.3. Action: ***Develop EW rescue protocol.*** *Medium*

Timeline: Year 1.
Actors: EWCP; EWCA; BFF-ET.
Accountability: EWCA.
Resources needed: EWCP; BFF-ET personnel.
Indicator of success: Protocol peer-reviewed, published and distributed.

GOAL 3. *Afroalpine habitats protected from further degradation, conserved, and restored.*

OBJECTIVE 3.1: To develop controlled grazing and sustainable resource use (including firewood utilisation) systems across all community-managed and currently non-managed wolf habitats within 5 years.

3.1.1. Action: ***Identify legitimate community representatives within South Wollo/North Wollo/ Mt. Guna/Arsi and establish community conservation councils for each Woreda within wolf range.*** *High*

Timeline: Year 1.
Actors: EWCP; FZS; Regional authorities; Local NGOs; Local woredas and kebeles.
Accountability: Amhara Regional Authority; Oromia Regional Authority.
Resources needed: $ 3,000 EWCP/FZS education officer.
Indicator of success: Community conservation council established at each woreda.

3.1.2. Action: ***Develop participatory management plans for controlled grazing and harvesting systems with community conservation council in South Wollo/North Wollo/Mt. Guna/Arsi.*** *High*

Timeline: Year 2.
Actors: EWCP; FZS; Regional authorities; Local NGOs; Local woredas and kebeles.
Accountability: Amhara Regional Authority; Oromia Regional Authority.
Resources needed: $ 10,000 Local and international NGO agricultural extension and outreach staff; woreda and kebele development officers.
Indicator of success: Management plans developed.

3.1.3. Action: ***Implementing/enforcing/monitoring the agreed plans in South Wollo/North Wollo/Mt. Guna/Arsi.*** *High*

Timeline: Year 3 – 5.
Actors: EWCP; FZS; Regional authorities; Local NGOs; Local woredas and kebeles.
Accountability: Amhara Regional Authority; Oromia Regional Authority.
Resources needed: $ 30,000 for each of the four areas. Community participation.
Indicator of success: Indicator(s) to be developed.

3.1.4. Action: ***Explore alternative sources of fodder for livestock around wolf areas.*** *Medium*

Timeline: Year 1 – 2.
Actors: ARD office; OFWE; Land administration office; Animal Health office.
Accountability: Amhara Regional Authority; Oromia Regional Authority.
Resources needed: Local and international NGO agricultural extension and outreach staff; woreda and kebele development officers.
Indicator of success: Report produced.

OBJECTIVE 3.2: To develop fire management plans for Bale Mountains National Park and for Arsi Regional Park.

3.2.1. Action: ***Review models for fire management in other protected areas.*** *Medium*

Timeline: Year 1.
Actors: EWCA; OFWE; FZS.
Accountability: EWCA.
Resources needed: Actor(s) personnel.
Indicator of success: Understanding of fire management systems.

3.2.2. Action: ***Research the relationship between fire and ecosystem function in Arsi.*** *Medium*

Timeline: Year 2 – 3.
Actors: OFWE; EWCP; Ethiopian Universities.
Accountability: OFWE.
Resources needed: $ 2,000 Masters student.
Indicator of success: Thesis finished.

3.2.3. Action: ***Develop and implement fire management plan for Afroalpine habitat under threat from fire in Arsi.*** *Medium*

Timeline: Year 4.
Actors: OFWE; EWCP.
Accountability: OFWE.
Resources needed: $ 5,000 Actor(s) personnel.
Indicator of success: Management plan implemented.

3.2.4. Action: ***Develop and implement fire management plan for Afroalpine habitat under threat from fire in Ba***le. *Medium*

Timeline: Year 2.
Actors: EWCA; FZS.
Accountability: EWCA.
Resources needed: $ 5,000 Actor(s) personnel.
Indicator of success: Management plan implemented.

OBJECTIVE 3.3: To reduce the expansion of agriculture and settlements in a) all protected areas by 100% within the next 5 years, and b) wolf range outside protected areas by 40% within the next 5 years.

3.3.1. Action: ***Discuss, negotiate and agree on settlement boundary and buffer zone around settlement areas, with priority focused on larger settlements (for example, Rira, Wege, Hawo in Bale).*** *High*

Timeline: Year 1.
Actors: EWCA; FZS; OFWE.
Accountability: EWCA.
Resources needed: BMNP; FZS personnel.
Indicator of success: Settlement boundaries formally agreed.

3.3.2. Action: ***Develop and implement a moratorium on immigration into protected areas.*** *High*

Timeline: Year 1.
Actors: EWCA; FZS; OFWE.
Accountability: EWCA.
Resources needed: BMNP; FZS personnel.
Indicator of success: Moratorium formally agreed.

3.3.3. Action: ***Consolidate settlements to within agreed settlement boundaries to limit habitat fragmentation and human-wildlife conflict with rehabilitation of habitat corridors where necessary.*** *High*

Timeline: Year 2.
Actors: EWCA; FZS; OFWE.
Accountability: EWCA.
Resources needed: BMNP; FZS personnel.
Indicator of success: No settlement outside agreed settlement boundaries.

3.3.4. Action: ***Demarcate the extent of community managed areas in all wolf ranges*** *High*

Timeline: Year 1-3
Actors: Regional EPA; FZS; OFWE.
Accountability: Regional authority; EWCA
Resources needed: Actor(s) personnel $ Unknown
Indicator of success: Areas demarcated

3.3.5. Action: ***Formal community management system developed and implemented in all communally managed areas.*** *High*

Timeline: Year 1-3
Actors: Regional EPA; OFWE; FZS.
Accountability: Regional authority; EWCA
Resources needed: Actor(s) personnel. $ Unknown
Indicator of success: Management plans developed

3.3.6. Action: *Community Conservation Areas (CCA) recognized and formally gazetted.* *High*

Timeline: Year 3-6
Actors: Regional EPA; OFWE; FZS.
Accountability: Regional authority; EWCA
Resources needed: Actor(s) personnel; $ Unknown
Indicator of success: Areas formally gazetted and recorded in necessary official documents.

3.3.7. Action: *Monitor habitat changes in community-conserved/managed wolf habitat.* *High*

Timeline: Year 2; Ongoing
Actors: Regional EPA; OFWE; FZS
Accountability: Regional authority; EWCA
Resources needed: Actor(s) personnel; $ Unknown
Indicator of success: Monitoring data analysed.

OBJECTIVE 3.4: To remove all new (within last 10-15 years) settlements and agriculture in protected areas within 5 years.

3.4.1. Action: *Develop a detailed resettlement plan for park resident communities (there are more detailed steps listed in Bale GMP to undertake this activity).* *High*

Timeline: Year 2.
Actors: EWCA; OFWE; FZS; BERSMP.
Accountability: EWCA.
Resources needed: $ 3,000 Consultant (BERSMP).
Indicator of success: Detailed and agreed resettlement plan ratified by Federal and Regional government.

3.4.2. Action: *Implement resettlement plan.* *High*

Timeline: Year 3 – 5.
Actors: EWCA; OFWE; FZS; BERSMP.
Accountability: EWCA.
Resources needed: $ Unknown – perhaps running into 100,000s. Federal and Regional government; Actor(s) personnel.
Indicator of success: All new settlements and agriculture removed from within PA.

OBJECTIVE 3.5: To reduce the impact of rightful (old) settlers in all areas by developing natural resource use agreements within 5 years (in all sites where rightful settlers are recognised).

3.5.1. Action: *Facilitate the formation of management groups and subcommittees that represent rightful users within communities.* *High*

Timeline: Year 2.
Actors: EWCA; FZS; Local Government; Community representatives.
Accountability: EWCA.
Resources needed: $ 500 per group. Actor(s) personnel.
Indicator of success: All people living within the boundaries of PA are signed-up members of a User Management Group.

3.5.2. Action: ***Negotiate and agree on principles and systems of shared responsibility for use, protection, regulation of natural resources, details of activities allowed and levels of use, benefit-sharing mechanisms, and rights and responsibilities of all partners with resource management groups.*** *High*

Timeline: Year 2.
Actors: EWCA; FZS; Local Government; Community representatives.
Accountability: EWCA.
Resources needed: $ 500 per group. Actor(s) personnel.
Indicator of success: All people living within the boundaries of PA are signed-up members of a User Management Group.

3.5.3. Action: ***Develop and agree system for review and revision of the natural resource management plan based on monitoring and evaluation results.*** *High*

Timeline: Year 2.
Actors: EWCA; FZS; Local Government; Community representatives.
Accountability: EWCA.
Resources needed: $ 500 per group. Actor(s) personnel.
Indicator of success: All people living within the boundaries of PA are signed-up members of a User Management Group.

3.5.4. Action: ***Draw up and sign resource management agreements, that outlines levels and rules of resource use and benefits, rights and responsibilities of all partners, and thus fulfils guidelines for NRM agreement contents*** *High*

Timeline: Year 2.
Actors: EWCA; FZS; Local Government; Community representatives.
Accountability: EWCA.
Resources needed: $ 500 per group. Actor(s) personnel.
Indicator of success: All people living within the boundaries of PA are signed-up members of a User Management Group.

OBJECTIVE 3.6: To support protected area management.

3.6.1. Action: ***Investigate and foster capacity-building and experience-sharing opportunities, and on-the-job training, for protected area staff*** *Medium*

Timeline: Year 1; ongoing.
Actors: EWCP; EWCA; FZS; Other NGOs; Regional Authorities; PA Managers.
Accountability: EWCA; Regional Authorities.
Resources needed: $ 50,000 Actor(s) personnel.
Indicator of success: Appropriately qualified and skilled staff working in protected areas.

3.6.2. Action: ***Develop stronger relationships between protected area staff and conservation organisations working in the area, through close cooperation, mutual support and reciprocal respect.*** *High*

Timeline: Year 1; ongoing.
Actors: EWCP; EWCA; FZS; Other NGOs; Regional Authorities; PA Managers.
Accountability: EWCA; Regional Authorities.
Resources needed: Actor(s) personnel.
Indicator of success: Healthy and beneficial working relationships in place.

GOAL 4. *Coexistence of wolves, people and their livestock fostered throughout the species' range.*

OBJECTIVE 4.1: To develop and expand (where already existing) education and awareness campaigns at different levels at each wolf site in the next 10 years.

4.1.1. Action: ***Identify target audiences.*** *High*

Timeline: Month 6.
Actors: EWCP; FZS.
Accountability: EWCP; FZS.
Resources needed: EWCP and FZS management, education and outreach personnel.
Indicator of success: Targets identified.

4.1.2. Action: ***Design education plans targeted towards specific audiences and objectives in each wolf site.*** *High*

Timeline: Year 1.
Actors: EWCP; FZS.
Accountability: EWCP; FZS.
Resources needed: $ 500 EWCP and FZS education and outreach personnel.
Indicator of success: Plans prepared.

4.1.3. Action: ***Design and print educational materials.*** *High*

Timeline: Year 1; ongoing.
Actors: EWCP; FZS.
Accountability: EWCP; FZS.
Resources needed: $ 10,000 EWCP and FZS education and outreach personnel.
Indicator of success: Materials printed.

4.1.4. Action: ***Community meetings and assemblies for distribution of material.*** *Medium*

Timeline: Year 2; ongoing.
Actors: EWCP; FZS; Regional Authorities; Local woredas and kebeles.
Accountability: EWCP; FZS.
Resources needed: $ 5,000 EWCP and FZS education and outreach personnel.
Indicator of success: Meetings held; Materials distributed.

4.1.5. Action: ***Develop extra-curricula environmental/nature clubs and activities.*** *High*

Timeline: Year 2; ongoing.
Actors: EWCP; FZS.
Accountability: EWCP; FZS.
Resources needed: $ 20,000 per year. EWCP and FZS education and outreach personnel.
Indicator of success: Nature clubs established.

4.1.6. Action: ***Establish and maintain forums for local communities and conservationists working in the area.*** *Medium*

Timeline: Year 2; ongoing.
Actors: EWCP; FZS; Local woredas and kebeles.
Accountability: EWCP; FZS.
Resources needed: $ 5,000 per year. EWCP and FZS education and outreach personnel; Local woreda and kebele education staff.
Indicator of success: Forums established.

4.1.7. Action: ***Create community ambassadors to promote the cause of the EW and to sustain a long-term awareness programme.*** *Medium*

Timeline: Year 2; ongoing.
Actors: EWCP; FZS; Local woredas and kebeles.
Accountability: EWCP; FZS.
Resources needed: EWCP and FZS education and outreach personnel; Local woreda and kebele education staff.
Indicator of success: Community ambassadors promoting wolf cause.

OBJECTIVE 4.2: To reduce the number of incidences of carnivore-human conflict (including direct persecution, killing, direct and indirect poisoning, predation) by 50% across all wolf populations within 10 years.

4.2.1. Action: ***Promote the appropriate use of fencing and livestock guarding to reduce predation on livestock. See 1.2.5*** *High*

Timeline: Year 2 – 5; ongoing.
Actors: EWCP.
Accountability: EWCP.
Resources needed: $ 50,000 EWCP education officer; Ethiopian agriculture / natural resource management student.
Indicator of success: Number of livestock killed by large carnivores reduced each year; local attitude toward large carnivores improved.

4.2.2. Action: ***Lobby the appropriate authorities to enforce regulations which outlaw the killing of wolves in community areas.*** *High*

Timeline: Year 1.
Actors: EWCP; FZS; Regional Authorities.
Accountability: EWCP; FZS.
Resources needed: $ 500 Actor(s) personnel.
Indicator of success: Number of wolves killed in each area reduced each year.

4.2.3. Action: ***Lobby the appropriate authorities to enforce regulations which outlaw the killing of wolves in protected areas.*** *High*

Timeline: Year 1.
Actors: EWCP; FZS; Regional Authorities.
Accountability: FZS.
Resources needed: $ 500 Actor(s) personnel.
Indicator of success: Number of wolves killed in each area reduced each year.

4.2.4. Action: ***Lobby the appropriate authorities to enforce regulations which outlaw the use of poisoning as a method to eradicate dogs and predators.*** *High*

Timeline: Year 1.
Actors: EWCP; EWCA; FZS; MoARD.
Accountability: MoARD; EWCA.
Resources needed: $ 500
Actor(s) personnel.
Indicator of success: Poison is illegal and use decreases.

GOAL 5. *All stakeholders, especially decision makers at the national, regional, and local levels, involved in, and committed to conserving wolves and their habitat.*

OBJECTIVE 5.1: To make all stakeholders aware of the Ethiopian wolf action plan within the first year, and to have the action plan endorsed at the national and regional level.

5.1.1. Action: ***Print and distribute action plan to all stakeholders.*** *High*

Timeline: Month 6.
Actors: EWCP; EWCA.
Accountability: EWCP.
Resources needed: $ 2,000 EWCP; EWCA personnel.
Indicator of success: Printed and distributed.

5.1.2. Action: ***Development of supportive materials in appropriate language.*** *High*

Timeline: Month 6.
Actors: EWCA; EWCP; FZS.
Accountability: EWCA; EWCP; FZS.
Resources needed: $ 2,000 Education and outreach officers.
Indicator of success: Production and distribution of support materials to stakeholders.

5.1.3. Action: ***Presentation to all stakeholders, and sensitisation, through meetings, etc.*** *High*

Timeline: Month 9.
Actors: EWCA; Regional Authorities; EWCP; FZS.
Accountability: EWCA; Regional Authorities; EWCP; FZS.
Resources needed: $ 3,000 Presentation team.
Indicator of success: Meeting conducted.

5.1.4. Action: *Secure endorsement.* *High*

Timeline: Year 1.
Actors: EWCA; Regional Authorities; EWCP; FZS.
Accountability: Focal person appointed by EWCA.
Resources needed: EWCA Focal person.
Indicator of success: Visible (signed) endorsement of action plan.

OBJECTIVE 5.2: To ensure coordination among all relevant stakeholders at the national and regional level for the implementation of the Ethiopian wolf action plan, throughout the lifespan of the plan.

5.2.1. Action: *Identify and appoint focal person within EWCA.* *High*

Timeline: Year 1.
Actors: EWCA.
Accountability: EWCA.
Resources needed: EWCA.
Indicator of success: Position filled successfully.

5.2.2. Action: *Establishment of steering committee for coordination and guidance of action plan implementation.* *High*

Timeline: Year 1.
Actors: EWCA; EWCP.
Accountability: EWCA; EWCP.
Resources needed: $ 500 EWCA Focal person.
Indicator of success: Committee formed and convened for first meeting.

5.2.3. Action: *Hold regular steering committee meetings.* *Medium*

Timeline: Ongoing (minimum once a year).
Actors: Steering committee.
Accountability: EWCA Focal person.
Resources needed: $ 500 per year. Steering committee.
Indicator of success: Approved minutes of the meeting.

5.2.4. Action: *Monitoring and evaluation of action plan implementation.* *High*

Timeline: Annually.
Actors: EWCA; Regional Authorities; EWCP; FZS.
Accountability: EWCA Focal person.
Resources needed: EWCA; Regional Authorities; EWCP; FZS.
Indicator of success: Actions being implemented.

OBJECTIVE 5.3: To ensure the commitment and coordination of all stakeholders at the site level to implement the action plan.

5.3.1. Action: ***Ongoing engagement with relevant local Natural Resource Management offices, woreda conservation councils to ensure implementation of the action plan.*** *Medium*

Timeline: Ongoing.
Actors: EWCA; EWCP; FZS; Regional Authorities; Woreda conservation councils.
Accountability: Relevant site managers.
Resources needed: Outreach and education staff.
Indicator of success: Site level commitment to implementation of the action plan.

5.3.2. Action: ***Sharing experiences at each site for cost-effective implementation of the action plan.*** *Medium*

Timeline: Year 1; Ongoing.
Actors: EWCA; EWCP; FZS; Regional Authorities.
Accountability: Relevant site managers.
Resources needed: Staff from relevant organisations.
Indicator of success: Regular communication; All players aware of others' activites.

OBJECTIVE 5.4: To use the media to promote the conservation of Ethiopian wolves at a national, regional and local level.

5.4.1. Action: ***Production and distribution of promotional materials in appropriate language to be used by relevant media at all levels.*** *Medium*

Timeline: Ongoing.
Actors: EWCA; EWCP; FZS; Regional Authorities.
Accountability: EWCA; EWCP; FZS; Regional Authorities.
Resources needed: $ 500 Education staff; Relevant media personnel.
Indicator of success: Increased coverage of Ethiopian wolf conservation activities.

5.4.2. Action: ***Involving local media in broadcasting of conservation activities (TV, radio and newspaper).*** *Medium*

Timeline: Ongoing.
Actors: EWCA; EWCP; FZS; Regional Authorities.
Accountability: EWCA; EWCP; FZS; Regional Authorities.
Resources needed: Relevant media personnel.
Indicator of success: Increased coverage of Ethiopian wolf conservation activities.

5.4.3.Action: ***Encouraging national and international wildlife film makers to publicize Ethiopian wolves and the afroalpine.*** *Medium*

Timeline: Ongoing.
Actors: EWCA; EWCP; FZS; Regional Authorities.
Accountability: EWCA.
Resources needed: Relevant media personnel.
Indicator of success: Increased international awareness and interest in the wolf.

5.4.4. Action: ***Maintenance, and regular content update, of website www.ethiopianwolf.org as a repository of information on Ethiopian wolf conservation.*** *Medium*

Timeline: Ongoing.
Actors: EWCP.
Accountability: EWCA.
Resources needed: $ 500 per year. www.ethiopianwolf.org webmaster; WildCRU.
Indicator of success: Increased coverage of Ethiopian wolf conservation activities.

GOAL 6. *Mechanisms developed to fairly share, across generations, the costs and benefits of wolf and Afroalpine conservation.*

OBJECTIVE 6.1: To (a) analyse the costs and benefits of implementing the EW strategic action plan within 4 years, and (b) publicise the benefits derived both locally and nationally from effective afroalpine conservation.

6.1.1. Action: ***Prepare 5 year budgets for Ethiopian wolf conservation activities at site level.*** *Medium*

Timeline: Year 1.
Actors: EWCA; EWCP; FZS; Regional Authorities; Woredas.
Accountability: EWCA; EWCP; FZS.
Resources needed: EWCP; EWCA; FZS personnel.
Indicator of success: Overall budget compiled.

6.1.2. Action: ***Conduct assessment into monetary gains achieved directly through wolf conservation.*** *Medium*

Timeline: Year 2 – 3.
Actors: EWCP; Researcher.
Accountability: EWCP.
Resources needed: Researcher.
Indicator of success: Report prepared.

6.1.3. Action: ***Make the case, nationally and internationally, for environmental services provided by Afroalpine ecosystems.*** *Medium*

Timeline: Year 2 – 3.
Actors: EWCA; EWCP; FZS.
Accountability: EWCA; EWCP; FZS.
Resources needed: EWCP; EWCA; FZS personnel.
Indicator of success: Awareness created.

6.1.4. Action: ***Explore potential for payment for ecosystem services (water, carbon).*** *Medium*

Timeline: Year 3; Ongoing.
Actors: FZS; Other NGOs.
Accountability: FZS.
Resources needed: FZS; Other NGO personnel.
Indicator of success: Report prepared.

6.1.5. Action: ***Explore international funding opportunities for climate change mitigation in sensitive ecosystems.*** *Low*

Timeline: Year 3; Ongoing.
Actors: FZS; Other NGOs.
Accountability: FZS.
Resources needed: FZS; Other NGO personnel.
Indicator of success: Report prepared.

6.1.6. Action: ***Promote a study to demonstrate costs and benefits of effective wolf and Afroalpine conservation to Ethiopia.*** *High*

Timeline: Year 1; Ongoing.
Actors: EWCP; FZS; University.
Accountability: EWCP.
Resources needed: $ 1,000 EWCP; FZS personnel; Researcher.
Indicator of success: Report prepared and distributed.

6.1.7. Action: ***Prepare and distribute, at the site level, education material outlining costs vs. benefits of effective wolf and Afroalpine conservation.*** *Low*

Timeline: Year 4; Ongoing.
Actors: EWCP; FZS: Other NGOs.
Accountability: FZS.
Resources needed: $ 2,000 Education officers.
Indicator of success: Material distributed.

OBJECTIVE 6.2: To trial responsible enterprises based on the Afroalpine natural resources as a means of novel livelihoods within 5 – 10 years.

6.2.1. Action: ***Identify potential resources and enterprises.*** *Low*

Timeline: Year 1 – 2.
Actors: EWCA; FZS; NGOs; Regional Authorities; Woredas.
Accountability: EWCA: FZS; NGOs.
Resources needed:
Indicator of success: Resources and enterprises identified and feasibility assessed.

6.2.2. Action: ***Identify and promote two pilot projects.*** *Low*

Timeline: Year 3 – 4.
Actors: EWCA; FZS; NGOs; Regional Authorities; Woredas.
Accountability: FZS; NGOs.
Resources needed:
Indicator of success: Sites selected; detailed business plans prepared.

6.2.3. Action: ***Implement pilot projects at chosen sites.*** *Low*

Timeline: Year 5 – 8.
Actors: NGOs; FZS.
Accountability: FZS; NGOs.
Resources needed:
Indicator of success: Pilot projects running.

Canid Specialist Group
IUCN/Species Survival Commission

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