Chapter 2
The Ethiopian wolf: Distribution and Population Status

J. R. Malcolm and C. Sillero-Zubiri

There have been three previous attempts to assess the range and status of the species. Yalden *et al.* (1980) collated all Ethiopian wolf locations known from the literature. This was followed by an assessment of the status of the species that estimated the world population at less than 1,000 animals (Malcolm 1984). Gottelli and Sillero-Zubiri (1990, 1992) summarized all information on the species' past and present distribution. This chapter will review the past and present habitat for the Ethiopian wolf and summarize historical and current populations.

With the exception of the Bale Mountains National Park (BMNP) it is difficult to arrive at wolf population estimates with any accuracy. Local ecological data on wolves' home ranges, social organisation, distribution and density are lacking. However, an attempt is made here to estimate the population of adult animals (> one year old) likely to exist in different locations on the basis of short visits and reports together with extrapolation from studies in the BMNP. Other factors such as the extent of suitable habitat remaining and human pressure are also taken into account.

Habitat

The Ethiopian wolf is restricted to the high montane ecosystem (Box 2.1). The species occurs in two main ecological zones in Ethiopia (following Hurni 1986), the afroalpine (approx. 3,700–4,400 m *asl*) and the subalpine (approx. 3,000–3,700 m). In the traditional Ethiopian classification these areas are *Wurch* (sometimes divided into *High Wurch* and *Moist Wurch*). No part of Ethiopia extends into the sub-nival zone found on the highest African mountains.

The Afroalpine Zone

Open areas above the treeline occur in ten parts of Ethiopia. Such afroalpine habitats have high diurnal temperature fluctuations with daytime temperatures on clear days in the 20s °C and regular nightly frosts. Rainfall data from high elevations in Ethiopia are scanty but indicate an annual range from 400–1,500 mm *p.a.*. Hail is common but snow occasional and short-lived. All areas have high levels of UV radiation. Soils tend to be shallow and gravelly and

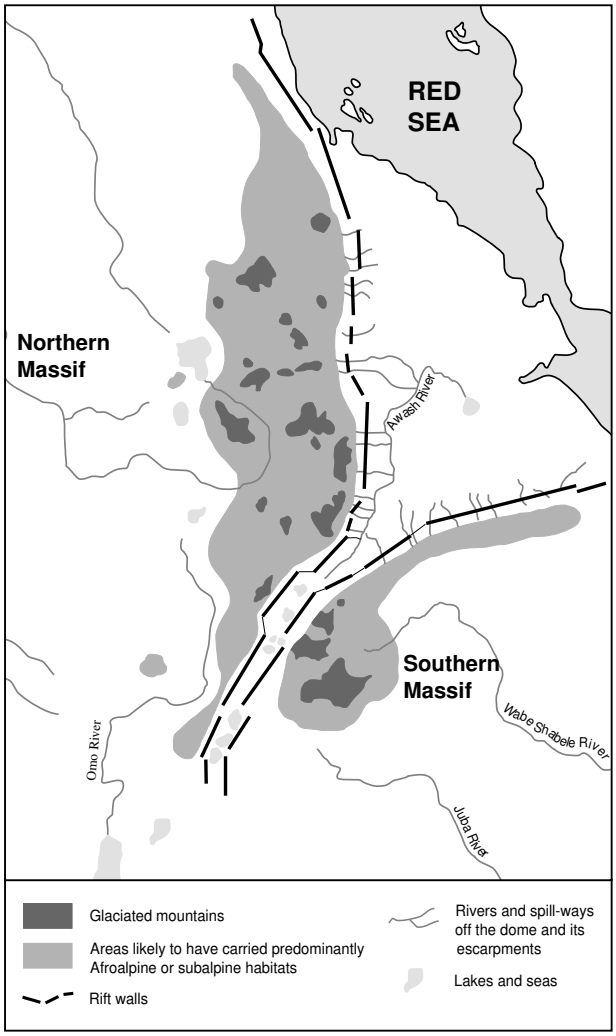

Figure 2.1. Probable range of afroalpine habitat during the major glacial periods (redrawn from Kingdon 1990).

Table 2.1
Past and present potential habitat for Ethiopian wolves

Altitudinal limits	Area of Habitat (km^2)	Ecological Zone
Last glaciation		
2,300–3,300 m	150,000 km^2	Afroalpine & subalpine
Present		
> 3,800 m	1,050 km^2	Afroalpine
3,300–3,800 m	4,660 km^2	Subalpine
Total	**5,710 km^2**	

are recently derived from volcanic rocks exposed since glaciers retreated (Hedberg 1964).

The Ethiopian afroalpine vegetation is dominated by grass and low-growing shrubs from which the peculiar giant lobelias (*Lobelia rhynchopetalum*) emerge. Hedberg (1964), working on mountains in East Africa, identified five major afroalpine vegetation communities: *Dendrosenecio* woodlands, *Helichrysum* scrub, *Alchemilla* scrub, Tussock grassland, and Bogs and related communities. The last four, but not the first, are found on Ethiopian mountains. Variations in moisture and topography determine which community predominates. *Helichrysum* scrub (usually the small grey shrub *H. splendidum*) covers large areas of drier (<900 mm *p.a.*) and flatter land. *Alchemilla* scrub dominates in the wetter areas. Tussock grassland and bogs occur in any area of impeded drainage. The different vegetation communities support different rodent densities and as a result different numbers of Ethiopian wolves (Sillero-Zubiri *et al.* 1995a, 1995b) (see Bale Mountains below).

There is little permanent human settlement in the afroalpine zone and little cultivation. However, the area is used by livestock and sedges harvested for thatching.

The Subalpine Zone

In the absence of humans, the subalpine zone in Ethiopia would probably support two main vegetation types: heathlands in the areas of well drained soil and grasslands in the areas of poorly drained soil. These two zones will be discussed in the context of human disturbance.

Heathlands

Giant heathers of the genera *Erica* and *Phillipia* occur in their undisturbed form in a few areas of the Bale Mountains, where between 3,100–3,500 m, they can form closed canopy woodlands with a height of 5–15 m. Above 3,400 m the plants decrease in size and blend gradually with the afroalpine shrubs between 3,500–3,800 m. Below 3,300 m trees, mainly *Hypericum revolutum* and *Hagenia abyssinica*, occur in increasing numbers in the heather. Heathlands have been cut and burnt by humans in almost all areas. Burning reduces the size of the plants and opens up the canopy so that a community of grass and small dicots grows between the plants. With more intense burning only scattered heather plants, often growing from large, old boles are left and in extreme cases grassland or *Helichrysum* shrub occurs in regions where heather would appear to be the climatic climax.

The heather zone is exploited for fuelwood production and managed for grazing using fire in all areas.

Grasslands

Tussock grass and sedges occur in the bottoms of valleys throughout the subalpine zone. A ring of short grass and small shrubs often circles the boggy areas. Derived grasslands cover much of the subalpine.

Barley cultivation extends into the subalpine region in all areas. However the maximum height of ploughing varies from around 3,600 m in parts of the Simien to about 3,300 m in parts of Bale and Arsi.

Marginal Ethiopian wolf habitat: subalpine heathland.

Box 2.1
The High Montane Ecosystem of Ethiopia

The Ethiopian wolf is one of a remarkable collection of species living above 3,000 m on Ethiopian mountains. Conservation of the wolf and its habitat is the best way to ensure the survival of this considerable biological wealth. These communities are of interest for at least three reasons:

1. Endemism

An array of organisms that colonized Ethiopia in glacial times are now isolated at high elevations and in many cases have become new species. For mobile forms, notably birds, many of the same species tend to occur on different mountain ranges in Ethiopia while for small mammals and plants separate species are sometimes found on the different mountains within Ethiopia.

Nineteen of the thirty mammals currently known to be endemic to Ethiopia live in the high montane area. Of these nineteen, eleven are shrews or rodents. As small mammals have not been studied on several of the mountain ranges, other small mammal species may not yet be identified. Rodents are the dominant herbivores on the afroalpine grasslands with densities up to 25 kg/ha in parts of the Bale Mountains. In most areas the endemic Ethiopian wolf preys on endemic rodents.

Two large and critically endangered ungulates and one primate are also high altitude specialists. The walia ibex (*Capra ibex walie*) is a southern offshoot of the Nubian ibex. It is now restricted to a small number of escarpments in northern Ethiopia. As many as 250 survive in the Simien Mountains although less than half are found in the Simien Mountains National Park. The world population may not exceed 400.

South of the Rift Valley the mountain nyala (*Tragelaphus buxtoni*) survives only in the Bale and Arsi Mountains and in parts of the Chercher Mountains further East. This large and sturdy member of the kudu family weighs up to 300 kg. In the Bale Mountains National Park it is most numerous in montane forest and grasslands around 3,000 m. Humans keep it from occupying this habitat in most other places and the final refuges of the species are in the heathlands and afroalpine grasslands. The BMNP contains the largest population numbering perhaps 1,500. It is doubtful that the world population exceeds 3,000 although there has been little recent census work.

The gelada baboon (*Theropithecus gelada*) is mostly restricted to the Ethiopian plateau North of the Rift Valley where it remains quite widespread in grassland areas. A small population has been found south of the Rift Valley in the Wabi Shabelle gorge recently and it may constitute a distinct subspecies.

Fifteen of Ethiopia's 26 endemic bird species live at high elevations. Notable species include the blue-winged goose (*Cyanochen cyanoptera*), which appears to be related to South American species. It occurs throughout the Ethiopian Plateau including the afroalpine zone. The largest bird of high elevations is the northern wattled crane (*Grus carunculatus*). This is a distinctively marked and genetically isolated race of a species that occurs at low elevations in southern Africa. Other montane endemics include a monotypic rail (*Rougetius rougetii*) and several passerines.

There are estimated to be 24 amphibians endemic to Ethiopia of which nearly half are from high elevations. The invertebrates remain largely unstudied.

The higher plants of the Ethiopian mountains are still being catalogued, and some ranges have not been visited. Collections, mainly from Bale, Arsi and Simien, suggest that there are between 100–150 high altitude endemic species. The most conspicuous is the giant lobelia (*Lobelia rhynchopetalum*), whose sentinel forms dot the afroalpine landscape.

continued on next page

2. The Palearctic connection

The high mountains of Ethiopia form an important biogeographic link with the temperate lands of Eurasia. During the temperate winter the mountains provide habitat for an array of palearctic migrants. The most conspicuous at high elevations are the waterfowl living on the rich alpine tarns. Several thousand wigeon (*Anas penelope*) and shovelers (*Anas clypeata*) winter in the Bale Mountains together with waders including the ruff (*Philomachus pugnax*) and the greenshank (*Tringa nebularia*). Golden, imperial and booted eagles (*Aquila chrysaetos*, *A. heliaca*, *Hieraaetus pennatus)* together with harriers (*Circus pygargus* and *C. macrourus*) live off the high altitude rodent fauna. The forests below support large populations of songbirds.

Three paleartic species, the chough (*Pyrrhocorax pyrrhocorax*), the ruddy shelduck (*Tadorna ferruginea*) and the golden eagle have their only known breeding sites outside the north temperate zone in the afroalpine zone of Ethiopia.

3. Special adaptations

The tops of African mountains have environmental conditions that differ dramatically from the lowlands below. Plants and to a lesser degree animals have evolved some peculiar adaptations in response to the afroalpine climate. Plant gigantism is the most striking example. Giant lobelias, tree heather (*Erica arborea*) and giant Saint John's wort (*Hypericum revolutum*) are important elements of the high montane flora of Ethiopia. The everlasting flowers (*Helichrysum spp*) are conspicuous over large areas of the montane habitat. Their highly reflective silvery leaves and dry, papery flowers allow them to survive in the desiccating winds up to 4,300 m.

Among the animals, the most extreme adaptation may involve a small toad (*Nectophrynoides malcomi*) that lives in damp areas from 3,300–4,200 m. Fertilization is internal and eggs develop out of water in moist soil. The species belongs to a group that has evolved unusual mechanisms of viviparity and ovoviparity.

The most peculiar of the mammals is the giant molerat (*Tachyoryctes macrocephalus*). This animal is restricted to the afroalpine regions of the Bale Mountains where it is common. It is several times larger than the related common molerat (*T. splendens*) of lower elevations. It also takes its food from above ground vegetation. Its eyes have migrated to the top of its head so that it can scan for predators while exposing as little of its body as possible. The tube-like body allows the molerat to stretch itself across the surface while keeping its hind legs in the burrow. The extensive burrowing and mound building activities of the molerats are dominant ecological forces in the afroalpine grasslands of the Bale Mountains.

Past and Present Availability of Habitat

Until the recent end of the Pleistocene epoch the highlands of Ethiopia were widely covered with afroalpine heathland and grassland (Messerli et al. 1977). These habitats generally lacked the herds of large ungulates characteristic of the African plains, but smaller mammals were present in great abundance, particularly molerats (Rhizomyinae) and grass rats (Murinae). The Ethiopian wolf, a specialist rodent hunter (Sillero-Zubiri and Gottelli 1995a), almost certainly evolved in Ethiopia during the Pleistocene glacial periods (Chapter 5).

The habitat available to the species would have varied with the climate. Figure 2.1, redrawn from Kingdon (1990), shows the extent of subalpine and alpine habitat at the peak of the last glaciation. Table 1.1 shows the areas of land in subalpine and alpine zones at the present and at the height of the last glacial period assuming the vegetation zones were depressed by about 1,000 m (Flenley 1979). The current habitat represents less than 10% of the species'

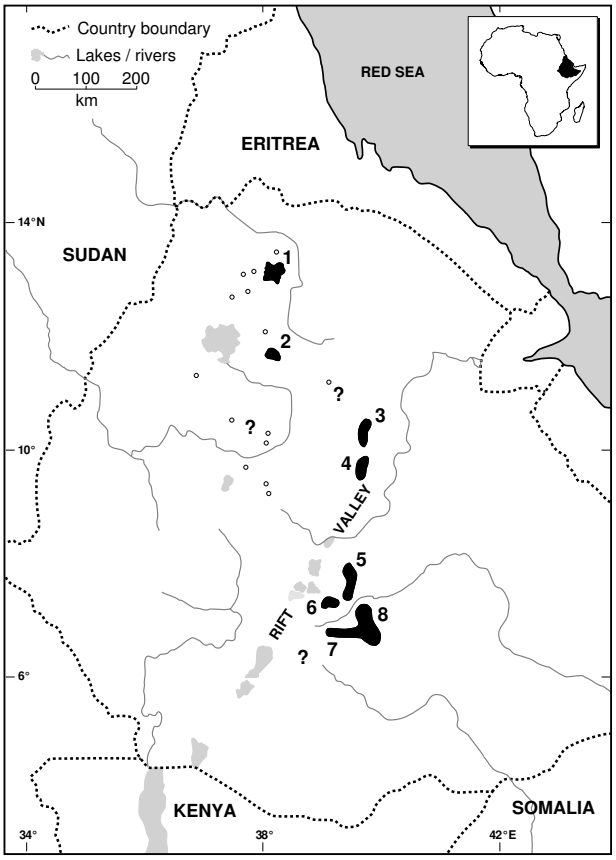

Figure 2.2. **Geographical distribution of the Ethiopian wolf. Current and historical range together with the 3,300 m contour, the lowest limit of the present subalpine zone.** Open circles indicate records prior to 1925 (from Yalden *et al.* 1980). Question marks indicate uncertain or unconfirmed records. **1**: Simien Mountains National Park; **2**: Mount Guna; **3**: Menz; **4**: Ankober; **5**: Arsi Mountains; **6**: Mount Kaka; **7**: Somkaro/Korduro Mountains; **8**: Bale Mountains National Park.

maximum range, and probably less than 20% of its average range over the last 500,000 years.

Figure 2.2 (modified from Yalden *et al.* 1980) shows the current and historical range of the species together with the 3,300 m contour, the lowest limit of the present subalpine zone. There are five areas where the species is now confirmed to occur and these are discussed below. One area around Mount Choke (4,154 m) in Gojjam (10° N, 38° E) has a number of historical sightings up to 1932 (Powell-Cotton 1902, Maydon 1925, Yalden *et al.* 1980) but has not been visited by naturalists for a long time. Early in 1996 however, the Important Bird Areas project visited Mount Choke and noted that they were very few rodents in the area, suggesting perhaps that it was unlikely that the wolves occurred there anymore (Yilma Delelegn pers. comm.). Von Heuglin (in Yalden *et al.* 1980) reported a sighting in 1862 from around Mount Abunie Josef (4,190 m) in Wollo (12° N, 39° E), but the area is not cited in any other faunal accounts since and has not been visited recently. Two other peaks in northern Shoa, Mount Amba Farit (3,975 m) (11° N, 39° E) and Mount Abuye Meda (4,000 m) (10° N, 39° E) and one in Gamo Gofa, Mount Guge (4,200 m) (6° N, 37° E) would appear on maps to have some area of wolf habitat but have neither historical nor recent sightings. Three of the records from before 1925 are from areas under 2,500 m, well below the current altitudinal limit of the species. They are probably unreliable (Yalden *et al.* 1980), as well as unconfirmed reports of the species occurring in Hararge and in Eritrea.

Simien Mountains

The Simien mountains (13° N, 38° E) lie 120 km northeast of the town of Gondar and include Ras Dashan, the highest peak in Ethiopia at 4,543 m. There is 1,350 km² of land above 3,000 m. The Simien Mountains National Park (SMNP), established in 1969, lies in the western part of the range and covers 190 km². The park was established to preserve the high altitude biota including the gelada baboon (*Theropithecus gelada*) and the walia ibex (*Capra ibex walie*) as well as some of the spectacular gorges and escarpments in the region. Information on the park can be found in the Management Plan (Hurni 1986) and Nievergelt (1981).

Afroalpine vegetation available to wolves extends from about 3,700 m and covers approximately 180 km². The flatter areas support mainly tussock grassland with abundant giant lobelias. Steep slopes and extensive cultivation provide little wolf habitat in the subalpine zone.

Wolves have been reported in the Simien mountains since the species was first described from the area in 1835 (Rüppell 1835). The species is regularly seen in three separate areas, each separated by about 8 km of lower ground from the other two (Fig. 2.3). Approximately two thirds of the wolf habitat lies outside the boundaries of the National Park. While Nicol (1971) and Müller (1977) reported a basic diet of grass rats (predominantly *Arvicanthis abyssinicus*), the species is seen most often in the tussock grasslands and boggy habitats where it is presumed to be eating swamp rats (*Otomys*) (Ato Gelay, pers. comm. 1994).

Sightings of wolves in Simien have always been scattered and irregular. Bailey in 1927 spent three weeks in the high altitude areas but did not mention the species (Bailey 1932). Brown (1964*a*, 1964*b*) recorded eleven wolf sightings in 12 days. Nicol (1971) feared an

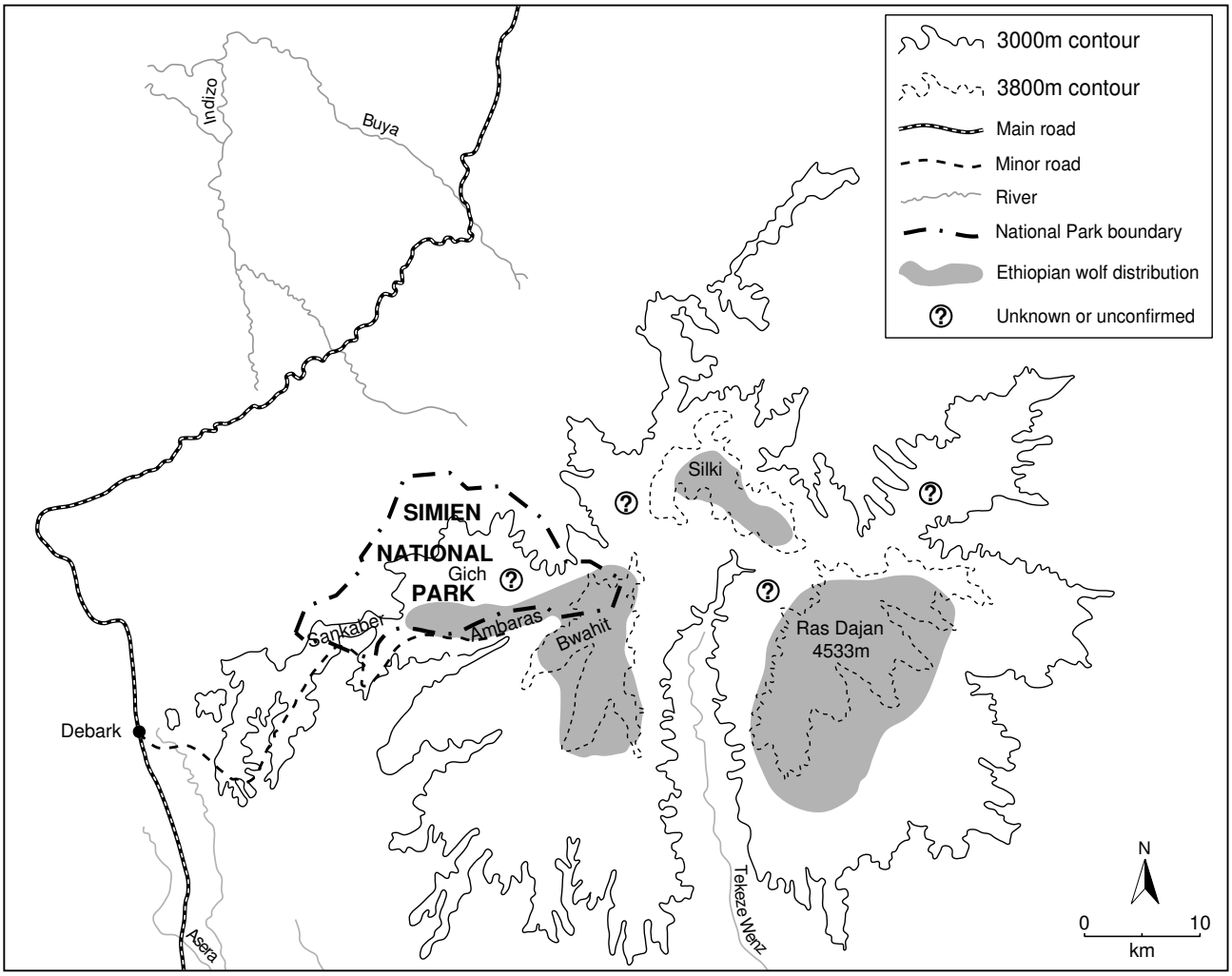

Figure 2.3. Probable distribution of Ethiopian wolves in the Simien Mountains.

imminent local extinction. Müller (1977) recorded 15 sightings of single wolves in Geech Plateau, SMNP, during one year. Hurni (1995, pers. comm.) saw wolves once in three months of field work in the SMNP in 1994. Guides working in the park expect to see wolves once every two or three days spent in the prime areas of afroalpine habitat (pers. comm. 1994). Professor Nievergelt, who worked in Simien between 1966–1973, in 1983, 1994 and 1996, indicated that while wolf sightings were never common the species seems rarer now than it was before (B. Nievergelt 1996, pers. comm.). It is possible that the low number of sightings reflects more secretive habits than in more southerly populations. However, human persecution is not evident, wolves appear to have about the same flight distance as in other areas and the low sightings probably indicate low numbers. The perceived population decline may be a consequence of the substantial increase on human activity on the Geech Plateau and the ensuing overgrazing of grasslands (Nievergelt 1996).

Biologists working in the Simien Mountains National Park since 1975 have estimated the number of wolves between 5–15 (Stähli 1975, Hurni 1986, pers. comm. 1995). The numbers inside the whole mountain range are estimated from 20–40 (Hurni 1995, pers. comm., Park Wardens' reports 1975–1995).

Using a habitat area of 200 km² and a low wolf density as suggested from all sources, the population in the area may number as few as 20–40 wolves.

Mount Guna

The isolated peak of Mount Guna (11° 45´ N, 38° 15´ E) rises to 4,231 m approximately 150 km south of the Simien mountains. There are 110 km² of

land above 3,400 m, but no more than 40 km² above the 3,800 m contour which may provide good habitat for the species. Following reports of wolves in the area, staff from the Ethiopian Wildlife Conservation Organisation (EWCO) visited Guna in June 1982. They confirmed the presence of the species (Yilma Delelegn pers. comm.). A limited area of afroalpine habitat remains (Malcolm 1995). A recent expedition to Mount Guna reported seeing an adult female near the summit and talked to several shepherds that had seen them recently (Andrew Pierce pers. comm.).

It is unlikely that more than 20 Ethiopian wolves survive in this small area.

Northeastern Shoa

The eastern wall of the Great Rift Valley in northern Shoa, central Ethiopia, provides a strip of potential wolf habitat. The area above 3,000 m extends for about 100 km from a point 20 km northeast of the town of Mehal Meda in Menz (10° 35´ N, 39° 45´ E) in the north to a point 15 km northwest of the town of Ankober (9° 35´ N, 39° 45´ E) in the south. It is bounded on the east by the 1,500 m escarpment of the Rift wall and on the west by the central Ethiopian plateau dissected in places by deep gorges. The area over 3,000 m is approximately 1,400 km² with peaks rising to 3,564 m in the northern area and to 3,730 m in the south. Over the last 20 years wolves have been reported at either ends of this linear piece of habitat with a gap between the northern and southern sightings of about 50 km (Tyler 1975, Groce and Groce 1977).

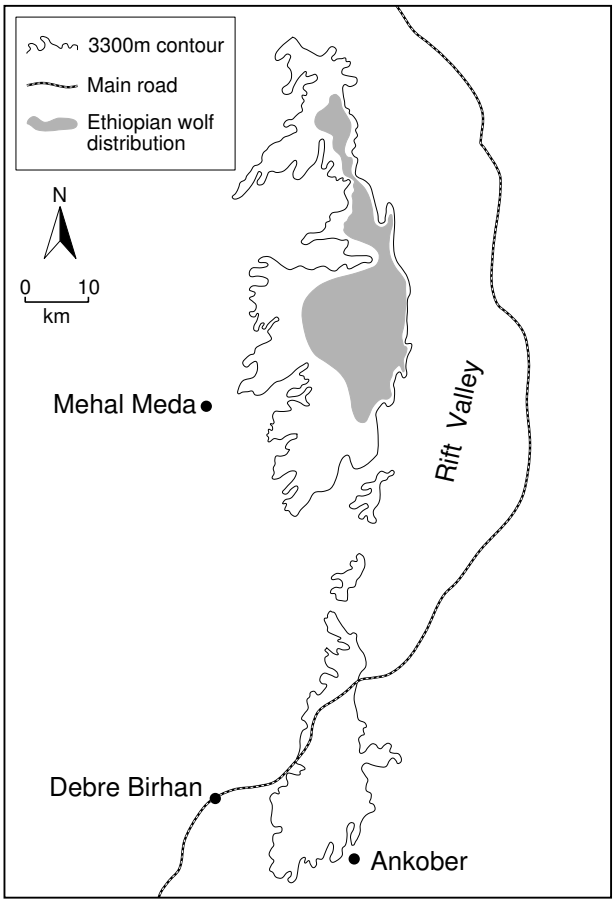

Figure 2.4. Distribution of the Ethiopian wolf in Northern Shoa.

The ridge area is dominated by tussock grassland (*Festuca spp*) known as *Guassa* in Amharic and used for thatch and basket work (Zelealem Tefera 1995). The valley bottoms have sedges and tall grasses. On steep slopes and in areas of thin soil, especially above 3,300 m, *Festuca* is increasingly replaced with *Helichrysum* and *Alchemilla* scrub. Short grass is common in these areas. Remnant heather plants occur along the edge of the escarpment, often with boles much larger than those of the current plants, suggesting that *Erica* would be more extensive in the absence of human-caused fires.

The status of Ethiopian wolves was assessed for both northern and southern areas by the authors (southern area in 1989 by CSZ and in 1994 by JRM; the northern area in 1994 by JRM and 1995 and 1996 by CSZ). Zelealem Tefera has observed wolves in the area in 1994 and 1995 (Zelealem Tefera 1995) and wolves were also reported by a EWCO mission that visited the northern area in 1992 (Mateos Ersado and Leykun Abunie 1992).

Northern Area – Menz

Almost 100 km² of suitable habitat remains in the northern area, traditionally known as *Guassa* (Fig. 2.4). The communal management of the *Festuca* grasslands (Zelealem Tefera 1995) has limited the impact of both grazing and cultivation (see Chapter 7). Currently barley fields extend to about 3,200 m.

Ethiopian wolves are seen regularly along the road from Tarmaber to Mehal Meda in the Gera area, southern end of the range, and were sighted by biologists in Asabo, at the northern part of the range. Indirect evidence of Ethiopian wolves, in the form of droppings and diggings, is as common in this area as in parts of the Bale Mountains rated as 'good' habitat (see Bale Mountains below). Prey populations of grass rats (*Arvicanthis spp*) and swamp rats (*Otomys*) could be seen and heard and the diggings of the common molerat (*Tachyoryctes splendens*) were conspicuous. Dissection of nine droppings confirmed that all three species occurred in the diet (Sillero-Zubiri 1995).

Using a habitat area of 100 km² and extrapolating from data on wolf densities from Bale, the population in the area could number from 50–75.

Southern Area – Ankober

There is only a narrow strip of afroalpine and subalpine vegetation at the southern end of the ridge and in some places (*e.g.* Gosh Meda) the cultivation extends to the escarpment.

Ethiopian wolves were reported from this area in 1974 by Tyler (1975) and in 1988 by J.C. Hillman (pers. comm.). The area was visited in both 1989 and 1994 by the authors and all but 5 km of the ridge was walked. No wolves were seen or heard and no indirect sign was found. Some of the local people, particularly from the older generation, knew the animal. A night-watchman protecting a microwave tower in an area of apparently suitable habitat reported sightings from as recently as 1992.

We do not think that a population survives in the area and suspect that transients that have moved south down the ridge from the Menz area may account for recent sightings.

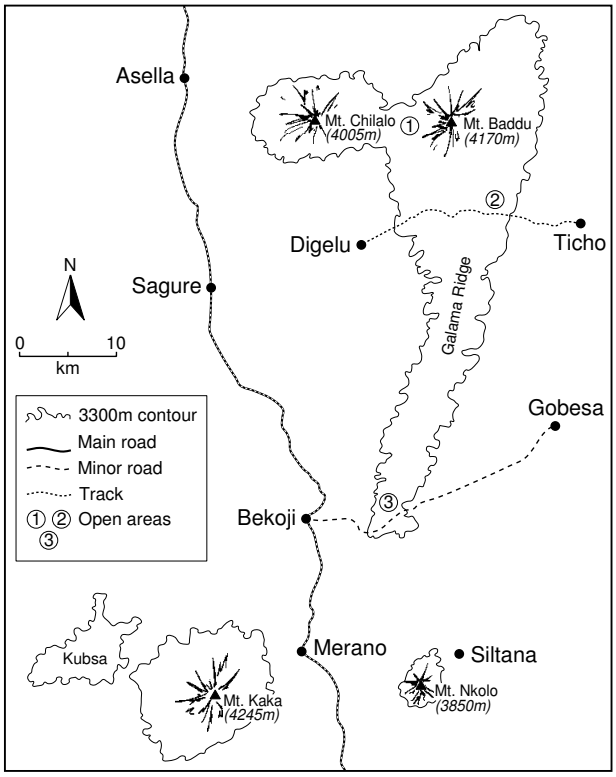

Figure 2.5. Distribution of afroalpine range in Arsi where Ethiopian wolves are known to occur.

Arsi Mountains

An area of high ground in former Arsi Region south of the Rift Valley wall has been known to support Ethiopian wolves since the turn of the century. The species has been sighted and collected at intervals *(e.g.* Fuertes and Osgood 1936, Brown 1966) from at least three locations of the Arsi range Mount Kaka, Galama ridge and Chilalo Mountains. Mount Kaka was visited by CSZ in 1990 (Gottelli and Sillero-Zubiri 1990) and the Galama ridge area by JRM in 1995 (Malcolm 1995). The whole area was studied on a Landsat transparency (Scene 167/055) dating from 1987 (Malcolm 1995).

Figure 2.5 outlines the five regions above 3,300 m in Arsi, and Table 2.2 shows their respective areas. This contour is close to the limit of human cultivation and heathlands predominate above it, covering over 90% of the area (from the satellite image). The heather is burnt regularly and varies from 0.5–2.5 m depending on the time since the last fire. Recently burnt areas have short grass and small dicots between the *Erica*. Areas close to the peaks, mainly above 3,900 m, are extremely rocky with *Helichrysum* and short grass. Areas of impeded drainage have tussock grass and are often surrounded by a zone of *Helichrysum* scrub.

The whole area is grazed, although there are few

Table 2.2
Estimated Ethiopian wolf numbers in Arsi (June 1995)

Region	Area of Habitat (km)	Wolf Density (min) 0.1/km²	0.15/km²	(max) 0.2/km²
Nkolo	18	2	3	4
Kaka/Kubsa	196	20	29	38
Chilalo/Galama	572	57	86	114
Total	**786**	**79**	**118**	**156**

Tullu Deemtu.

permanent settlements above the zone of cultivation. Livestock are herded up each day. Burnt heather sticks are an important source of fuelwood for the lower lying areas and people walk up each day to collect the wood. Mountain nyala (*Tragelaphus buxtoni*) occur in the heather and remnant montane forest on the east of the main ridge. Sport hunting of mountain nyala and other species was permitted until 1993.

Two wolves were seen and several others heard during two days spent by CSZ on Mount Kaka (4,180 m) in 1990. Wolf droppings and diggings were present above 3,600 m and common above 3,860 m. Local people interviewed reported wolves in the smaller Kubsa mountain, some 15 km west of Mount Kaka. An Ethiopian wolf was seen in eastern Arsi, at the south end of the Galama ridge, by JRM in June 1995. Interviews with local people revealed that Ethiopian wolves are seen, at least occasionally, in all areas above 3,300 m. Sightings are rare in areas of continuous heather.

The species is seen regularly in the open and more swampy areas throughout most of the Arsi range. Grass rats, swamp rats and common molerats occur throughout the area. The satellite image showed at least 90% of the area was covered with heathlands. Extrapolating from data on wolves in the heathlands of the Bale Mountains, a density of between 0.1–0.2/km² over much of the area seems likely (Table 2.2). It is possible that the small areas of open and swampy habitat are important centers for the species and population densities appeared higher in them.

Migration of Ethiopian wolves between the five pieces of habitat has not been reported. However, the greatest distance between areas of suitable habitat does not exceed 20 km and some movement seems likely, thus all five areas could be treated as a single population.

The total wolf population in Arsi was estimated at 80–160 with a best guess at 120 in nearly 800 km of suitable habitat. It is the largest population outside the Bale Mountains.

Bale Mountains

The Bale Mountains, lying southeast of the Rift Valley and south of Arsi include the largest area of afroalpine habitat on the continent and over 4,000 km above 3,000 m. Little was published about the area until recently. Smeds (1959) was the first to record Ethiopian wolves in the range and Mooney (1963) confirmed their presence on the highest peak in southern Ethiopia (Tullu Deemtu, 4,377 m) in the Bale Mountains. Leslie Brown (1964c, 1966) did extensive surveys and established that the largest existing populations of both Ethiopian wolves and mountain nyala survived in the area. As a result, the BMNP was proposed and its boundaries drawn up in 1969. The area has received protection from the EWCO since then (although BMNP has never been officially gazetted). Information on the National Park is available from the Management Plan (Hillman 1986).

Wolf habitat occurs along an east/west ridge about 100 km long with the main areas of high ground at its eastern end (Fig. 2.6). The ridge falls away steeply on its southern side and slopes more gently on the northern side towards the Wabe Shebelle river drainage. Areas below 3,200 m on the northern side are heavily cultivated with remnant Juniper forests. To the south large areas of closed canopy montane forest persist. *Hagenia/Hypericum* woodland occurs close to the treeline in all areas (3,200–3,500 m) and this grades into subalpine heathlands from about 3,400–3,800 m. Afroalpine habitat extends to the summits. It is possible that the heathlands extended into the current afroalpine in the past but have been reduced by fire (Miehe and Miehe 1994).

The vegetation along the Web Valley, which drains a large area in the north eastern part of the range, is exceptional. A wide valley in the upper part of the drainage at 3,500 m is covered with afroalpine habitat. Lower down, at 3,000 m, an area of edaphic grasslands

The Web Valley.

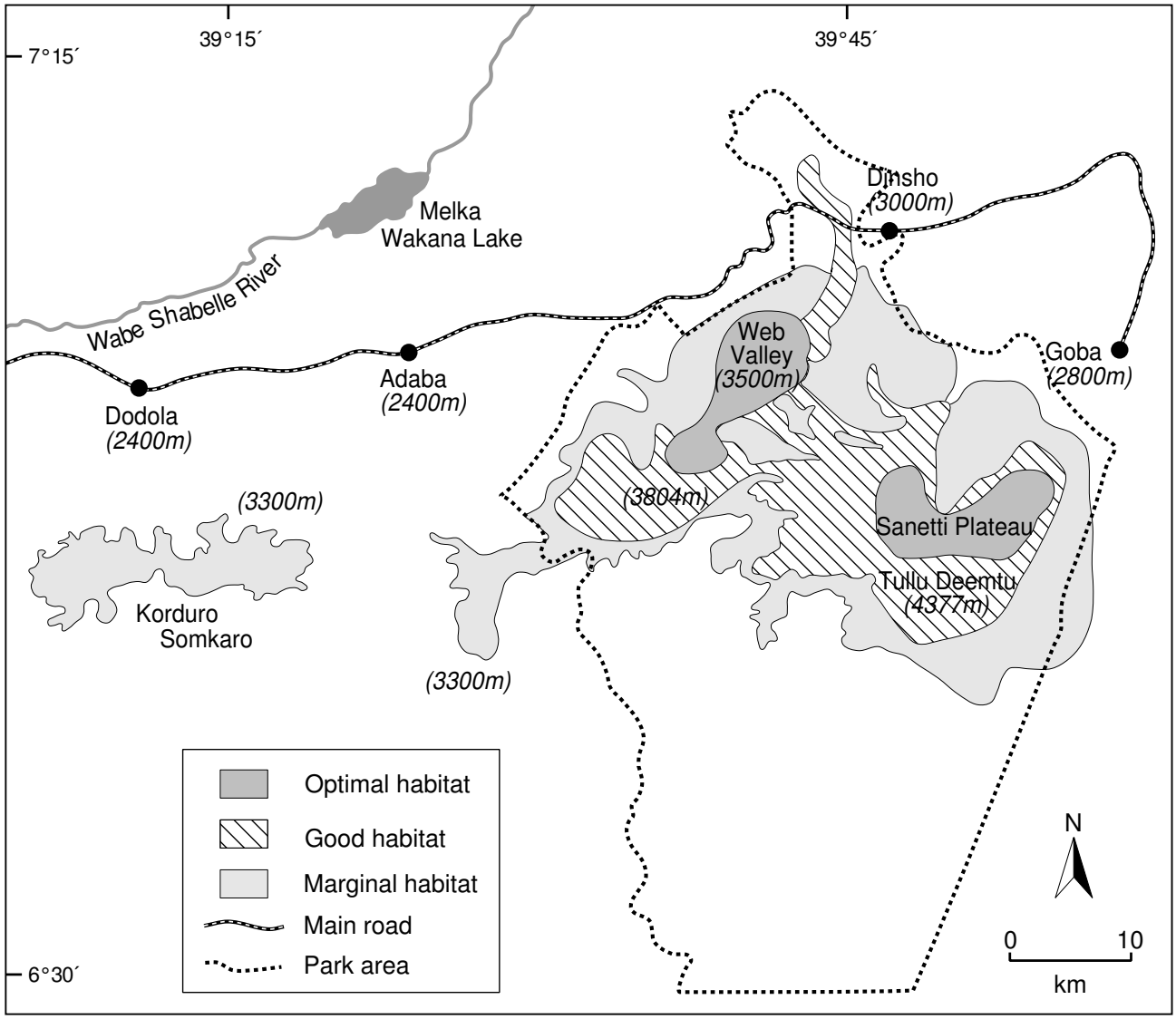

Figure 2.6. Bale Mountains National Park.
Different habitat types, and concurrent value for Ethiopian wolves, are indicated.

(Gaysay Valley) in the forest zone provides wolf habitat at an unusually low elevation.

Oromo people and their livestock occupy the whole area. Cultivation on all but the steepest slopes has been attempted in most areas up to 3,500 m. Ploughing has been tried in parts of the upper Web Valley but has not persisted. There are permanent settlements of pastoralists in the Web Valley and a few houses as high as 4,000 m in other areas. People and livestock travel across the mountains and many domestic animals are driven into the high area to mineral rich springs (called *horas*).

Mountain nyala occur throughout the afroalpine and subalpine zones and are particularly common in and around the grassland area on the lower Web Valley. The Bale Mountains support populations of at least 17 mammals endemic to Ethiopia of which nine are characteristic of high-altitude grasslands and heathlands

The Gaysay Valley.

Table 2.3
Endemic mammal species found in the Bale Mountains, indicating those characteristic of high–altitude grasslands and heathlands

Myotis scotti	Scott's hairy bat	
Crocidura baylei	shrew	✓
Crocidura bottegoides	shrew	
Crocidura harenna	shrew	
Crocidura thalia	shrew	
Dendromus lovati	Lovat's mouse	✓
Megadendromus nikolausi	Nikolaus' mouse	
Mus mahomet	Mahomet's mouse	
Praomys albipes	white–footed rat	
Stenocephalemys albocaudata	white–tailed rat	✓
Stenocephalemys griseicauda	grey–tailed rat	✓
Arvicanthis blicki	Blick's grass rat	✓
Lophuromys melanonyx	black–clawed mouse	✓
Tachyoryctes macrocephalus	giant molerat	✓
Lepus starki	Stark's hare	✓
Canis simensis	Ethiopian wolf	✓
Tragelaphus buxtoni	mountain nyala	

(Hillman 1993, Yalden and Largen 1992) (Table 2.3). There are 16 Ethiopian endemic birds recorded from the mountains and several rare endemic amphibians (Hillman 1993).

Information on Ethiopian wolves in Bale comes almost exclusively from areas within BMNP. The park includes about 90% of the available habitat. Data from the small areas of habitat to the west and north of the park will be mentioned at the end of this section. We have surveyed the population of Ethiopian wolves periodically since 1976. JRM attempted censuses in Dec/Jan 1975/6, Dec/Jan 1976/7 and Sept/Oct 1987 (Malcolm 1976, 1977, 1987). He attempted a direct count in one area and estimated wolf abundance by indirect evidence (droppings and diggings) and vegetation over the rest of the range. In 1982 an Ethiopian wolf monitoring program was established by J.C. Hillman. Sightings and sighting distance are recorded for all wolves seen from a vehicle along 32 km of road that crosses the Sanetti Plateau, one of the prime pieces of afroalpine habitat. CSZ, with D. Gottelli, studied the species intensively from 1988–1992. They made exact counts of known individual wolves in three areas of good habitat, together with estimates of prey abundance from rodent trapping. Rodent trapping in other areas combined with other indirect evidence provided a basis for extrapolation.

The best estimate for the number of Ethiopian wolves in the Bale Mountains at any given time comes from the work of CSZ and D. Gottelli in 1988/90 (Gottelli and Sillero-Zubiri 1990, 1992). They identified areas of marginal, good and optimum wolf habitat (Table 2.4).

Table 2.4
Estimate of Ethiopian wolf numbers in 1990 and 1992 for different habitat types in the Bale Mountains National Park

Habitat	Area km²	Density (adults/km²) 1990	1992	Habitat characterized by:
Optimal	253	1.0/1.2	0.35/0.5	Afroalpine grasslands with short grass and herbs. Rodent biomass estimate 27–29 kg/ha.
Good	267	0.25/0.35	0.2/0.3	Uniform *Helichrysum* dwarf–scrub. Rodent biomass less than 1/5 of optimal habitat.
	62	0.25/0.35	0.2/0.3	Northern grasslands: 1/2 of optimal habitat.
Marginal	360	0.1/0.2	0.1	Ericaceous belt. Rodent biomass less than 1/10 of optimal habitat.
	137	0.1	<0.1	Barren peaks and lava flows.
Total	**1,079**			

These corresponded broadly but not exactly with vegetation communities. The total population in BMNP at that time was estimated at 440–470.

The highest wolf concentrations in BMNP (1–1.2 adult/km²) were found in extensive rolling short grasslands and valley meadows typified by the Sanetti Plateau and Web Valley (Fig. 2.7). The open landscape of the Sanetti Plateau is dominated by the activity of rodents and by frost-induced soil movements. The burrowing of the giant molerat and cryoturbation keeps the vegetation in permanent pioneer stages, dominated by short herbs and grasses (less than 0.25 m high), such as *Alchemilla abyssinica*, *Polygonum plebejum*, *Trifolium acaule*, *Anthemis tigrensis*, *Artemisia schimperi* and *Poa muhavurensis* (Miehe and Miehe 1993). In the Web Valley livestock grazing and molerat activity are the main vegetational disturbances, and the primary vegetation is a short herb community, dominated by *Alchemilla spp.* and specked by *Helichrysum* and *Artemesia* shrubs. These open grasslands supported a high biomass of rodents, in the order of 2,000–3,000 kilograms per km² (Sillero-Zubiri *et al.* 1995b).

Secondary *Helichrysum* dwarf-scrub is the dominant plant formation in the drier southern declivity of the Bale Mountains and was classified as good habitat,

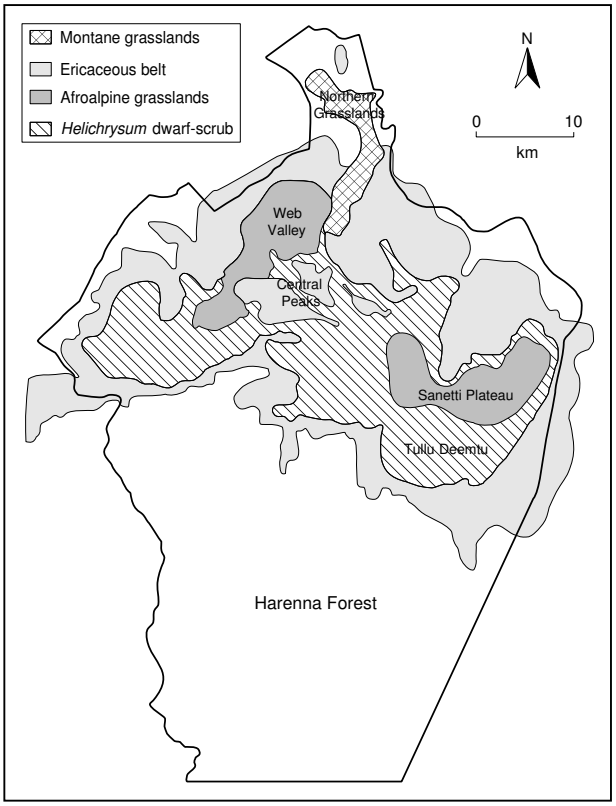

Figure 2.7. Vegetation types in the Bale Mountains National Park (modified from Hillman 1986).

Photo of the Sanetti Plateau.

represented by the Tullu Deemtu area and southern central parts of the Bale massif above 3,600 m. Spherically shaped *H. splendidum shrubs*, 30 to 50 cm tall, dominate, but leave open space to tussock grasses such as *Agrostis quinqueseta* and *Festuca richardii* (Miehe and Miehe 1993). Diurnal rodent biomass in the southern plateau was only one sixth of that on Web and Sanetti (Sillero-Zubiri *et al.* 1995b) and sustained a lower wolf density (0.2 adult/km²). A small area of montane grassland and scrubland dominated by sage brush (*Artemesia afra*) in the northern area of BMNP (Gaysay Valley) at 3,000 m supported a similar wolf density (<0.5 adult/km²).

The afroalpine range of optimal Ethiopian wolf habitat in BMNP is surrounded by a belt of heathland (*Erica trimera* secondary scrub and *Phillippia spp.*). Giant molerats are virtually absent from the ericaceous belt and other diurnal rodent are scarce. Barren rocky peaks and lava covered areas above 3,600 m were marginal for the species, with an estimated density of 0.1–0.2/km².

In 1989 CSZ surveyed wolf habitat in the west of the mountain range outside BMNP, in the Somkaro and Korduro areas. Heavily burnt heather interspersed with small marshy areas and rocky plateaux provide about 100 km² of suitable habitat. Rodent trapping revealed densities similar to good wolf habitat in BMNP and common molerat signs were widespread. Wolves were heard but not seen in three days spent in the area. A population of 15–20 adults was estimated (Gottelli and Sillero-Zubiri 1992, Sillero-Zubiri 1989). Large heather-covered mountains extend north from the BMNP over an area of about 120 km² , known as the Lajo spur. It is possible that a few wolves survive there but the area has not been surveyed.

In summary between 460 and 510 adult Ethiopian wolves were estimated living in the Bale Mountains in 1990 with less than 10% of the population outside the boundaries of the National Park.

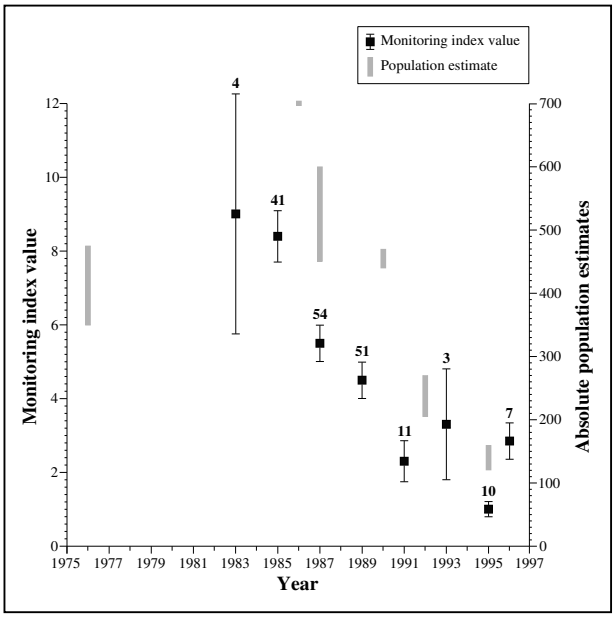

Figure 2.8. Number of Ethiopian wolves sighted on Sanetti Plateau during transects, with grey bars showing the various population estimates as explained in the text.

The population of Ethiopian wolves in the Bale Mountains has fluctuated over the last 25 years and is now considerably lower than the figure for 1990. Figure 2.8 shows the number of wolves sighted on the Sanetti Plateau since 1976 together with six estimates of absolute abundance for the same area. Estimates of absolute numbers (from small areas of known density) correlate well with the monitoring data. It appears that the numbers were at a maximum in the mid-1980s and have declined steadily since then. Figures from the mid-1970s corresponded well with those from the late 1980s and from 200–250 wolves appeared to have lived on the Sanetti Plateau at those times. The factors responsible for the changes in numbers are discussed in Chapter 3 below.

The numbers in the whole of the Bale Mountains appear to have followed closely the numbers on the Sanetti Plateau. Declines in the early 1990s on Sanetti were recorded in other parts of the habitat and the wolf population was estimated at 205–270 in 1992 (Gottelli and Sillero-Zubiri 1992). JRM and CSZ visited BMNP in 1994–1995. Ethiopian wolves occurred throughout their former range but at greatly reduced numbers in all areas (Malcolm *et al.* 1994, Sillero-Zubiri 1995). This continuous population decline is closely associated with outbreaks of disease from 1990–1992 (Chapter 4). Some reproduction occurred in the 1994 breeding season but the survival of these young is unknown. Karen Laurenson visited BMNP in early 1996 (Laurenson 1996) and Claudio Sillero-Zubiri in late 1996. Extrapolating from the monitoring data and current surveys it is likely that the population of Ethiopian wolves in the Bale Mountains 1996 (December 1996) is less than 200.

The current population in Bale is estimated at less than 200.

Discussion

Habitat Requirements

The species is most abundant in open and moist areas above 3,300 m. It is less common in the drier areas of the afroalpine zone and uncommon in continuous heathlands. However, small areas of grassy and boggy habitat in the subalpine zone may be important. The distribution closely follows that of its primary prey species, rat-sized rodents and molerats. The lower altitudinal limit of the species is not clear as the primary prey species occur at lower elevations. In many areas it is restricted by human cultivation. In the BMNP it survives in a grassland area at 3,000 m where it is sympatric with golden jackals (*Canis aureus*). In Shoa an area of apparently suitable uncultivated grassland at 2,800 m and only 10 km from where Ethiopian wolves lived was occupied by common jackals but not wolves.

Total Population Estimate for 1996

Table 2.5 summarizes information on Ethiopian wolf populations. The species is known to survive in five areas, may occur in two other areas and has been recently extirpated from an eighth area. The three small known populations from north of the rift valley (*C. simensis simensis*) may number 100 adult wolves. The two populations south of the rift valley (*C. simensis citernii*) are estimated at 295.

We therefore estimate a world total close to 400.

Table 2.5
Summary of known and possible Ethiopian wolf populations from north to south in 1995

Location	Habitat available Total[1]	Habitat available Afroalpine	Population estimate	Notes
NW of Rift Valley				
Gondar				
Simien Mountains	680	180	20–40	
Mount Guna	110	<25	10–20	
Gojjam				
Mount Choke	?	?	?	Historical records
Wollo				
Mount Abunie Josef	?	?	?	Suitable habitat, no records
Shoa				
Mount Amba Farit	?	?	?	Potential habitat
Mount Abuye Meda	?	?	?	Potential habitat
Mehal Meda	95	20?	50–75	
Ankober	46	10?	0	Recently extirpated
Sub-total	***> 930***	***> 245***	***80–135***	
SE of Rift Valley				
Arsi				
Arsi Mountains	786	20?	80–150	
Bale				
Bale Mountains NP	1,209	646	120–180	
Somkaro/Korduro Mts2	155	?	15–20	
Lajo Spur	121	0	<10	
Gamo Gofa				
Mount Guge	?	?	?	Habitat, no records
Sub-total	***> 2,270***	***> 666***	***225–360***	
Total	**> 3,200**	**> 911**	**305–495**	

[1] Afroalpine and sub–Afroalpine habitat potentially available to Ethiopian wolf, in km².