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Community Resource Uses and Ethiopian Wolf Conservation

Community resource uses and Ethiopian wolf conservation in Mount Abune Yosef
Girma Eshete, Girmay Tesfay, Hans Bauer, Zelealem Tefera Ashenafi, Hans H. de Iongh & Jorgelina Marino
Published in *Environmental Management* (2015) 56: 684-694

Abstract

People who perceive economic benefits and enjoy unrestricted access to natural resources tend to support ecosystem conservation efforts. Our study explores whether this remains true in remnant patches of the Afroalpine ecosystem in North Ethiopia, where communal land provides valuable natural resources for the local communities and also sustains small populations of the endangered Ethiopian wolf (*Canis simensis*). Questionnaires were designed to assess ecological and socio-economic characteristics of the livelihoods of the Amhara people living in Mount Abune Yosef and their attitudes toward Afroalpine and Ethiopian wolf conservation. Of the 120 households interviewed, selected randomly from across eight villages, 80% benefited from natural resources by grazing their livestock and harvesting firewood and grasses. The majority (90%) also suffered from livestock predation by Ethiopian wolves and common jackals (*Canis aureus*) and crop raiding by geladas (*Theropithecus gelada*), birds and rodents, yet more than half reported having a positive attitude toward Ethiopian wolves (66%). People with positive attitudes tended to live close to the communal land, to own more livestock, and to be unaffected by conflict. Many also recognised the need to protect the Afroalpine habitats of Abune Yosef (71%), and this attitude predominated among the literate, and households that owned land, had smaller herds and were further away. We discussed how people's attitudes were modulated by human–wildlife conflicts and by the benefits derived from having access to the natural resources of communal land, and the implications for the conservation of the Afroalpine ecosystem and the flagship Ethiopian wolf.

Keywords

Afroalpine ecosystem, attitudes, Ethiopian highlands, human–wildlife conflict, natural resources

4.1 Introduction

People who perceive economic benefits and enjoy unrestricted access to natural resources are expected to be supportive of ecosystem conservation efforts (Kellert, 1985, Bruner *et al*., 2001, Walpole and Goodwin, 2001, Wang and Macdonald, 2006). However, if the economic consequences of human–wildlife conflict for local poor households become unbearable, attitudes toward the conservation of biodiversity can change significantly (Oli *et al.,* 1994, Treves and Karanth, 2003, Naughton-Treves *et al*., 2005, Thirgood *et al*., 2005, Woodroffe *et al*., 2005, Treves, 2007).

In the highlands of Ethiopia, the traditional livelihoods of the Amhara people combine subsistence agriculture with livestock rearing, complemented by access to natural resources in communal Afroalpine areas, including water, construction materials, firewood, and grazing land (Gebremedhin and Swinton, 2002, Ashenafi *et al*., 2012). The Afroalpine ecosystem of Ethiopia have been used for millennia under unrestricted access by the surrounding communities (Ashenafi and Leader-Williams, 2005, Ashenafi *et al*., 2012), but the rapidly growing human populations are posing new challenges. The intensification of farming and livestock grazing is resulting in environmental degradation and conflicts with wildlife across Ethiopia (Stephens *et al*., 2001, Bekalo and Bangay, 2002, Yirga *et al*., 2012), with potential consequences for the conservation of Afroalpine ecosystem (Ashenafi and Leader-Williams, 2005, Marino, 2003).

The Ethiopian highlands harbour an exceptionally diverse array of endemic species, among them the endangered Ethiopian wolf (*Canis simensis*) (Marino and Sillero-Zubiri, 2011), gelada baboon (*Theropithecus gelada*), walia ibex (*Capra walia*), and several species of Spalacidae and Murinae rodents (Yalden and Largen, 1992). The communal land in Mount Abune Yosef, North Wollo, is a good example of a high-biodiversity Afroalpine remnant that is critically important for the Amhara people and for Ethiopian wolves alike (Ash, 2001, Marino, 2003). In such a setting, people's attitudes toward conservation can have important consequences for the survival of wolves and other highland endemics, and for the long-term sustainability of traditional livelihoods. In particular, it is likely that communities develop negative attitudes toward wildlife conservation as a result of livestock predation or crop raiding (Sekhar, 1998, Treves, 2007, Marino, 2003).

Previous studies of human–wildlife conflict in Ethiopia have been conducted within protected areas (Yihune *et al*., 2008, 2009, Tessema *et al*., 2010), where contact between people and wildlife is largely restricted to the protected area boundaries. In the densely populated highlands of Mount Abune Yosef in Wollo, however, these interactions will be more frequent and will lead to conflicts due to livestock predation by common jackals (*Canis aureus*) and Ethiopian wolves (Marino, 2003, Marino *et al*., 2010) and dam-

age to barley fields caused by geladas and rodents (Dunbar, 1998, Yihune *et al*., 2009, Kifle *et al*., 2013). If the economic consequences of these conflicts are significant for the local farmers, negative attitudes toward conservation might arise (Treves and Karanth, 2003, Yirga *et al*., 2012, Winterbach *et al*., 2013). To test this hypothesis, we conducted semi-structured interviews to generate qualitative and quantitative information about local livelihoods and wildlife conflicts in Mount Abune Yosef, taking into account the benefits derived from access to natural resources in communal lands and how these affect people's attitudes and tolerance toward wildlife.

4.2 Methods

4.2.1 Study area

Mount Abune Yosef (hereafter AY) is located in the Lasta district of North Wollo Zone, between 12^0 8' 7" N and 39^0 15' 7" E (Fig. 1). This isolated mountain reaches up to 4286 m asl and contains approximately 50 km^2 of suitable wolf habitat (Marino, 2003, Saavedra, 2009). The climate is humid and cold, with a wet season from June to October, and a dry season from November to May. The average annual rainfall is 2,000 mm and the mean annual temperature ranges between 7.5 °C and 11 °C (ESP, 2001). The highlands of North Wollo are watersheds for three main river basins (Tekeze, Awash, and Blue Nile basins). The Amhara people have been settled in these highlands for millennia. They still use traditional methods for farming and bring their livestock to graze in Afroalpine pastures. AY also has cultural value due to its scenery and the presence of endemic animals, which attract a growing number of visitors, and because it has been an important religious site for centuries, with many churches and monasteries (Saavedra, 2009). Mount Abune Yosef is located close to the holy city of Lalibela, one of Ethiopia's top tourist attractions. Taking advantage of this situation, a community-based tourism initiative was started a few years ago, with the support of international NGOs.

The landscape is open and dominated by grasslands and heathlands, with steep slopes covered by rock and shallow soils, and valleys and depressions, with deep black soils, sustaining an important green biomass. The mosaic of Afroalpine vegetation types includes '*guassa*' grasslands (*Festuca* spp.), giant lobelias (*Lobelia rhyncopetalum*), *Euryops* bushes locally known as '*chifra*', '*kirshiba*,' or '*charranfe*,' and remnant patches of Erica spp. forests. In AY, there are 43 species of mammals, including seven Ethiopian endemics, and 221 species of birds, of 16 Ethiopian endemic birds six are present in AY, making it the second most important bird area in the country (EWNHS, 1996, Lepage, 2006, Saavedra, 2009).

4.2.2 Data collection and analysis

Pilot surveys were initially conducted in 16 households to gather background information and to test and adapt the questionnaire. Between October 2009 and April 2011, 120 households were interviewed, selected randomly from a list of 2014 households across eight villages in four Peasant Associations or 'kebeles' (the smallest local administration unit). The residents of these villages visit the Afroalpine area of AY frequently to herd their livestock, to collect grass and firewood, or when en route to local markets. It was agreed that the information collated would only be used for the purpose of this study.

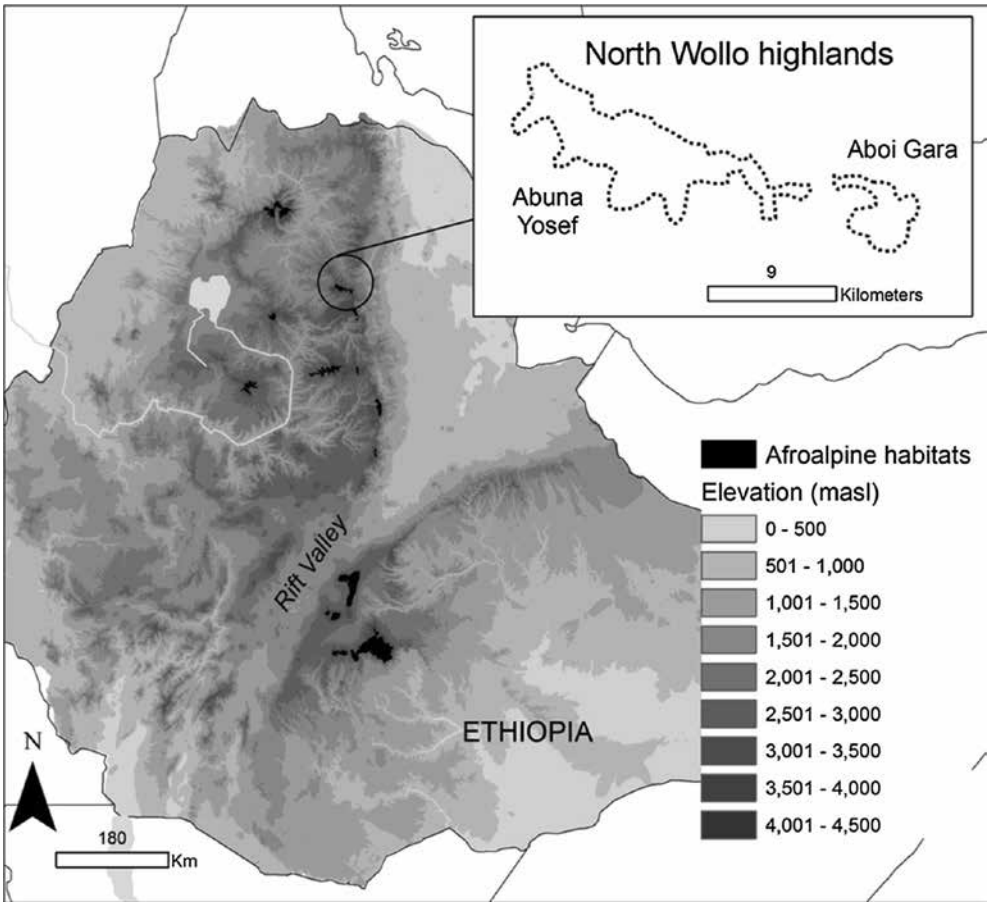

Figure 4.1
Map indicating areas of Afroalpine habitat in the Ethiopian highlands. Inset shows study area of Abune Yosef and adjacent Aboi Gara

The questionnaire (Appendix) was designed to evaluate the local uses of Afroalpine natural resources for own consumption or commercial purposes (e.g., firewood and grasses are sold for cash or exchanged in local markets for goods and services that are not locally available or are in short supply), the extent to which households were affected by predation, their views regarding the need to protect Abune Yosef, and their attitudes toward wolves. We collected information about the heads of the households that is expected to influence attitudes, such as sex, marital status, family size, and educational status, together with other information related to their livelihoods, expected to influence their degree of dependence upon additional Afroalpine resources, such as firewood and grasses, to complement their livelihoods; namely whether the family owns land for agriculture ('own land'), the size of the plot ('land size'), whether they keep livestock ('herd size' as number of heads) and the grazing regime (months grazing at Mount Abune Yosef, and by season: dry and wet). Regarding conflicts with wildlife, the heads of households were asked about the types of conflict they are exposed to, namely livestock predation and crop raiding, and their frequencies and overall trends. Regarding attitudes, people were asked their views on the need to protect AY and their attitudes toward wolves and the possibility of wolves and people co-existing in AY.

To calculate the financial benefits derived from the commercialisation of natural resources, local market prices for the year 2010/11 were considered (load of firewood = 20 Ethiopian birr; load of hay and thatch grass = 50 Ethiopian birr), and converted to US dollars at an exchange rate of USD 1 = 10 Ethiopian birr.

Descriptive statistics were used to describe local livelihoods, and cross tabulations and Chi square tests for categorical variables. We used logistic regressions to explore variations in peoples' attitudes, using a binary-response model (e.g., yes/no answers: 0 for a negative response and 1 for positive). All analyses were conducted with the statistical packages SPSS (version 16) and SAS-JMP 5 software.

4.3 Results

4.3.1 Socio-economic characteristics and resource uses

Regarding the socio-economic profile, most heads of households were married men and over half of them were illiterate. The majority owned land (average 0.7 ha) and a small herd of livestock (average 14 head) (Table 4.1). Eighty percent of the households benefited economically from the use of natural resources, but this proportion varied across villages (Table 4.2) and over half (61.7%) used Afroalpine pastures to graze, for at least nine months a year.

All households located within 10 km of Mount Abune Yosef exploited some natural resource, but only a small proportion of the households located farther away (Figure 4.2). More landless households utilised natural resources compared with the households that owned agricultural land (X^2 = 4.62, df = 1, P < 0.05).

Table 4.1
Characteristics of the 120 households interviewed

	Number / percentage of households					
Sex	Male	103	85.8%	Female	17	14.2%
Marital status	Married	103	85.8%	Single	17	14.2%
Educational status	Illiterate	63	52.5%	Literate	57	47.5%
Own land	Yes	104	86.7%	No	16	13.3%
Affected by wildlife damage	Affected	108	90.0%	Not affected	12	10.0%
AY needs protection	Yes	85	70.8%	No	35	29.2%
Responsibility to protect AY	Community	96	80%	Government	24	20%
Attitude towards Ethiopian wolf	Positive	79	65.8%	Negative	41	34.2%
Can co-exist with wolves	Yes	72	60%	No	48	40%
Continuous variables	**Minimum**	**Maximum**	**Mean**	**SD**		
Age	18	80	47.5	12.268		
Family size	1	10	5.7	1.827		
Distance to Afroalpine area (km)	2	15	7.72	4.199		
Herd size (number of heads)	0	78	13.69	10.509		
Land size (ha)	0	2.3	0.70	0.440		

Regarding the uses of natural resources, two-thirds of the households reported collecting firewood, and many harvested thatching grass and hay (Table 4.3). Other natural resources were used as farming implements, construction materials and medicinal plants, while tourism provided income to nearly one-third of the households interviewed (Table 4.3).

Table 4.2
Households per village that utilise natural resources from Abune Yosef

Village	Households sampled	Benefit from natural resource uses
Eyebelay	17	13 (76.5%)
Korit	11	11 (100%)
AbuneYoseph	14	14 (100%)
Latige	10	10 (100%)
Kassegne	22	20 (90.9%)
Enjafat	13	4 (30.8%)
Shegla	11	9 (81.8%)
Ybaro	22	15 (68.2%)
Total	120	96 (80%)

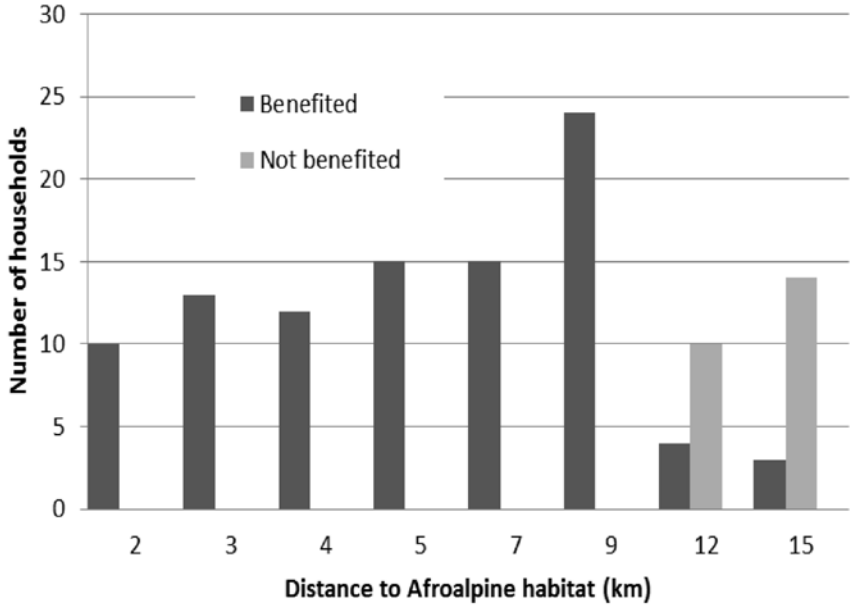

Figure 4.2
Number of households that benefited from using natural resources at various distances from Abune Yosef

Table 4.3
Types of economic resources/services households obtained from Abune Yosef (n=120)

Resources	Number of households	%
Firewood	89	74.2
Thatching grass	76	63.3
Hay grass	66	55
Tourism	35	29.2
Other	92	76.7

The estimated financial benefit perceived by households was on average USD 92 per year, ranging from USD 5 from firewood sales to USD 300 from tourism revenues (tourist guiding, renting pack animals, and selling locally made items) (Table 4.4).

Table 4.4
Economic benefits that households perceived from the use of natural resources in Abune Yosef

Resource	Annual income (in Ethiopian birr)				N
	Minimum	Maximum	Mean	SD	
Firewood	50	1050	324.8	272.8	89
Thatching grass	75	1500	477.4	362.8	76
Hay grass	120	1500	421.6	303.6	66
Tourism	100	3000	659.1	659.1	35

4.3.2 Conflicts and attitudes

Nearly every household surveyed reported some form of wildlife damage, including livestock predation by Ethiopian wolves and common jackals, and crop damage by geladas, birds and rodents (Table 4.5). Half of the households suffered from both livestock predation and crop raiding. The type of conflict differed across the villages ($P < 0.01$), while people in Enjafat and Latgie did not report wildlife-related damage, most households in Eyebelay, Korit and Ybaro experienced both livestock predation and crop raiding (Table 4.5).

Table 4.5
Wildlife conflicts and percentage of households affected across villages

Villages	Households sampled	With conflicts	%	Livestock Crop		
				predation only	damage only	both
Eyebelay	17	17	100	2 (11.8%)	3 (17.6%)	12 (70.6%)
Korit	11	11	100	3 (27.3%)	1 (9.1%)	7 (63.6%)
Abune Yoseph	14	13	93	6 (42.9%)	3 (21.4%)	4 (28.6%)
Latgie	10	7	70	6 (60%)	0	1 (10%)
Kassegne	22	20	91	9 (40.9%)	1 (4.5%)	10 (45.5%)
Enjafat	13	9	69	3 (23%)	2 (15.4%)	4 (30.8%)
Shegla	11	9	82	3 (27.3%)	0	6 (54.5%)
Ybaro	22	22	100	5 (22.7)	1 (4.6%)	16 (72.7)
Total	120	108	90	37(30.8%)	11(9.2%)	60 (50%)

Most people believed that Ethiopian wolf numbers were decreasing in AY, alleging habitat loss, emigration and competition with jackals as the causes (43, 26, and 21% respectively). However, people reported seeing Ethiopian wolves on average 6.0 ± 0.7 times over the previous 12 months, compared with 13.0 ± 1.7 per year when they were asked over the last five years. Wolves were seen alone or in groups of up to 12 (average 4.2 ± 0.2 wolves), and most commonly in the early and late hours of the day (59% at dawn and dusk, the rest at dawn only).

In spite of the relatively high frequency of livestock predation reported (affecting more than 90% of the households), more than half of people believed that people and Ethiopian wolves can co-exist in AY (60%) and that they feel positively about wolves (66%). This positive attitude was most common among households located close to Afroalpine areas, households with larger herds, and those less affected by wildlife predation (Table 4.6).

The majority of the respondents (71%) perceived a need to protect Abune Yosef, and many preferred a community-based approach (80%) over a government-led one. Interestingly, whether people used natural resources or not, whether they were affected by conflict or not, did not affect their perception.

Table 4.6
Result of logistic regression explaining people's attitudes toward Ethiopian wolves (1 = positive, 0 = negative)

Explanatory variables	Estimate	Std error	Chi-square	P-value
Age	0.005	0.024	0.044	0.838
Marital status (1= married)	-1.522	0.952	2.555	0.110
Sex (1 if male)	1.252	0.944	1.762	0.184
Family size	0.280	0.150	3.486	0.062
Educational status (1 = literate)	0.657	0.567	1.345	0.246
Distance to Afroalpine area	-0.141	0.057	6.111	0.013
Own land (1 if yes)	0.154	0.801	0.037	0.848
Herd size	0.132	0.044	9.128	0.003
Affected by wildlife damage (1=not affected)	2.193	0.742	8.744	0.003
R^2	0.361			
Correctly predicted percentage	76.7			
Observations	120			

Households that considered some form of conservation was necessary tended to have literate heads, to own land, to have smaller herds, and to live further away from the Afroalpine area (Table 4.7).

Table 4.7
Result of logistic regression explaining people's perceptions of the need to protect the Afroalpine ecosystem (1 = there is a need to protect AY, 0 = there is not)

Explanatory variables	Estimate	Std error	Chi-square	P-value
Age	-0.008	0.035	0.051	0.821
Marital status (1=married)	0.753	1.113	0.457	0.499
Sex (1= male)	-0.833	1.110	0.562	0.453
Family size	0.223	0.175	1.611	0.204
Educational status (1= literate)	2.723	0.729	13.938	0.000
Time living at AY	0.017	0.024	0.516	0.473
Distance to Afroalpine area	0.248	0.096	6.601	0.010
Own land (1= yes)	2.593	0.928	7.812	0.005
Herd size	-0.087	0.037	5.615	0.018
Firewood collection (1= yes)	0.085	0.991	0.007	0.932

Explanatory variables	Estimate	Std error	Chi-square	P-value
Thatching grass collection (1=yes)	0.144	0.868	0.028	0.868
Hay grass collection (1= yes)	0.490	0.786	0.390	0.533
Affected by wildlife damage (1= not affected)	0.625	0.873	0.513	0.474
R^2	0.456			
Correctly predicted percentage	78.3			
Observation	120			

4.4 Discussion

Our study exemplifies how people's attitudes toward conservation and wildlife can be modulated by socio-economic characteristics and by conflicts with wildlife, in a case where open-resource uses might conflict with the conservation of a charismatic endemic such as the Ethiopian wolf.

The local communities of Abune Yosef resembled other rural communities that engage in small-scale agriculture and livestock rearing, and which depend on biodiversity for their subsistence, for example, as a source of energy, building materials, drinking water, and products that can be bartered and sold in local markets to access goods and services that are not locally available (Lewis *et al*., 1990, Newmark *et al*., 1993, Winterbach *et al*., 2013). Subsistence farmers around AY exploited diversified goods and environmental services from the Afroalpine ecosystem, as do communities in other Afroalpine areas of Ethiopia under some level of resource use management such as the Guassa Conservation Area (Ashenafi, 2001) and the Simien Mountains National Park (Yihune *et al*., 2008). The communities of AY use Afroalpine pastures intensively, in many cases all year round, and depend on Afroalpine bushes as sources of firewood and to commercialise. This is the reality across rural Ethiopia, where most people depend on firewood for cooking and lighting, and on livestock as a form of financial insurance for times of necessity (Taddese, 2001). The communities of AY also benefited financially by the commercialisation of Festuca grasses and hay, used as fodder and for thatching and basket making (Ashenafi *et al*., 2012, Jacob *et al*., 2014), and other wild plants used for medicine and construction (Ashenafi, 2001). Interestingly, a considerable proportion of the households benefited from tourism, revealing the significant financial impact of these tourist activities led by the local communities of AY. This adds to the evidence that tourism can be an important alternative source of income when developed as a community-based initiative, as it is in the Guassa Community Conservation Area in

Ethiopia (Ashenafi and Leader-Williams, 2005) and in other African countries (Binns and Nel, 2002, Hutton and Leader-Williams, 2003, Lindsey *et al*., 2007, Hoole, 2009, Mbaiwa and Stronza, 2010). The estimated annual income derived from ecosystem goods and services provided by Mount Abune Yosef was USD 92 per household, a substantial economic contribution considering that the per capita average Gross National Income (GNI) of Ethiopians was USD 470 in 2013 (World Bank, 2013).

Consequently, most people considered the protection of natural resources positively, as their livelihoods will logically depend on the long-term persistence of these ecosystem services. Their attitudes, however, vary with socio-economic factors as in other rural areas of Africa, including the benefits derived from environmental goods and ecosystem services as well as the economic losses due to livestock predation (e.g., Romanach *et al*., 2007, Lagendijk and Gusset 2008, Dickman, 2010). As expected, literacy was associated with people's perceptions of the need for conservation, a common pattern globally in North America (Kellert *et al*., 1996), South Africa (Lagendijk and Gusset, 2008), and Uganda (Kugonza *et al*., 2009). Farmers who own land, and thus have a rural land certification provided by the local Land Administration Office, are entitled to use the farmland and surrounding natural resources, and thus are more inclined to believe they will benefit from conservation. In comparison, landless households exploit natural resources in unregulated ways, and might therefore feel threatened by conservation initiatives. This finding is consistent with studies in Ethiopia and elsewhere showing that farmers who own land are more collaborative toward biodiversity conservation activities than farmers using state-owned or non-private land (Ellis 1996, Rahmato, 2003, Teklu, 2003, Romanach *et al*., 2007, Kugonza *et al*., 2009). Furthermore, the people living farther away from the communal land and with smaller herds had a greater recognition of the need to protect Abune Yosef. One logical explanation is that the families living close to the communal land and with more head of livestock are competing for the resources, whereas people living farther away perceive a greater urgency to protect the resources in the longer term and for the benefit of everyone. Among the families living close by, some might perceive conservation as a threat, as this entails restrictions on harvesting, traditionally free grazing rights, and displacement. With respect to the charismatic Ethiopian wolf, a flagship for the conservation of Afroalpine habitats, most people were positive about the wolves and believed in human–wolf coexistence. However, the challenges that livestock predation might involve for the local household economies were evident in the association between negative attitudes, smaller herds (i.e., households that will face a relatively high economic cost), and past exposure to livestock predation. Still, persecution and retaliatory killings were never reported as a cause of the perceived decline in the wolf population, and are not considered as threats to Ethiopian wolves elsewhere (Sil-

lero-Zubiri and Macdonald, 1997, Ashenafi *et al.*, 2005, Marino *et al.*, 2013). These contradicts with lessons from many other regions of the world, where predation by wild carnivores almost invariably generates negative attitudes among rural residents, and the ensued retaliation leading sometimes to severe population declines (e.g., Woodroffe, 2000, Bauer, 2003, Sogbohossou *et al.*, 2011).

4.4.1 Conservation implications

Our study describes the delicate equilibrium between the socio-economic needs of local people and the need to protect the Afroalpine ecosystem in AY, because the local livelihoods not only depend on the income generated from natural resources but also suffered from wildlife-related costs. Careful management will be required if the dual goals of wildlife conservation and economic livelihood for communities are to be met (Linnell *et al.*, 2001, Hutton and Leader-Williams, 2003, Winterbach *et al.*, 2013). Although Ethiopian wolves are specialised rodent hunters, this study shows that in the heavily populated highlands of North Ethiopia they are common predators of livestock, possibly a reflection of dietary adjustment to less abundant rodent prey and high livestock availability (Sillero-Zubiri and Gottelli, 1995, Marino *et al.*, 2010). Still, due to their high charisma, conflicts have been kept in check. A reason for concern is the possibility of conflicts increasing as human and livestock populations in rural Ethiopia continue to grow, threatening the sustainability of the local livelihoods and heralding the emergence of retaliation (Dovie *et al.*, 2006, Lagendijk and Gusset, 2008). Understanding and mitigating the risk of livestock predation should be considered a priority for AY and other Ethiopian wolf populations. Results from the Simien Mountains National Park (Yihune *et al.*, 2008) and other protected areas in Africa (e.g., in Cameroon by Van Bommel *et al.*, 2007 and in Botswana by Schiess-Meier *et al.*, 2007) indicate that predation will be highest close to the Afroalpine habitats where jackals and wolves live, and that predation will vary with the prevailing grazing regimes and guarding techniques.

Interventions designed to ensure access to natural resources while promoting long-term sustainability will contribute to maintain positive attitudes among people in AY (Dickman, 2010, Winterbach *et al.*, 2013), and continued willingness to co-exist with carnivores (Kellert *et al.*, 1996, Hutton and Leader-Williams, 2003, Bath *et al.*, 2008, Dickman, 2010). Considering that, demand for land in itself is a major threat to the conservation of Afroalpine ecosystems, opportunities for alternative incomes should always be promoted to ensure positive attitudes toward conservation among landless households in AY, of which tourism is a good example.

Acknowledgements

This study was funded by the Ethiopian Wolf Conservation Programme, sponsored by Born Free, the Wildlife Conservation Network and PTES, with support from the Frankfurt Zoological Society, the Rufford Small Grants Foundation, and the North Wollo Zone Environmental Protection Department. Our thanks go to the communities of Abune Yosef who contributed their time and knowledge, and to the field assistants Desiew Gelaw and Dessale Melakie

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Appendix

Part 1 Introductory question

Date of interview _____

Enumerator's name _____

1 Name of household head _____

Woreda _____

Kebele _____

Village _____

Age _____

Marital status 0 Single 1 Married

Sex 0 Female 1 Male

Family size _____

Educational status: 0 Illiterate 1 Literate

How long have you lived in your current area? _____

How far is your residence from Mount Abune Yosef (in km) _____

Do you own land? 0 No 1 Yes

If yes, what is the size of your land holding in hectares? _____

How many livestock do you own at this time?

cattle _____ mules _____

sheep _____ horses _____

goats _____ donkeys _____

Part 2 Economic benefits gained from Mount Abune Yosef

1. For how many months do you graze at Mount Abune Yosef (AY)? During dry season _____ during wet season _____
2. Does AY bring economic benefit to your household? 0. No 1. Yes
3. Based on question 2, which type of benefit?
   - **a** Firewood 0. No 1. Yes If yes, how many loads of firewood do you collect and how much of it did you sell in the last 12 months? _____ Market price of firewood per load in Ethiopian birr (ETB) _____
   - **b** Thatching grass 0. No 1. Yes If yes, how many loads of thatching grass do you cut and how much of it did you sell in the last 12 months? _____ Market price of thatching grass per load in ETB _____
   - **c** Hay grass 0. No 1. Yes If yes, how many loads of hay do you harvest and how much of it did you sell in the last 12 months? _____ Market price of hay per load in ETB _____
   - **d** Did you get income from tourists who visited AY in the last 12 months? 0. No 1. Yes If yes, in what type of tourist activity are you involved? How much ETB did you make from tourism in the last 12 months? _____
   - **e** Other benefits you get from AY and their estimated income _____
4. On average, what benefits do you estimate you make in ETB from AY in a year?

Part 3 Attitudes towards Afroalpine ecosystem, Ethiopian wolf and wildlife conflict

5. Is there a need to protect the natural resources of the AY Afroalpine ecosystem? 0. No 1. Yes
6. Who do you think should manage the protection of the AY Afroalpine ecosystem? 0. Government 1. Local community
7. List wildlife that you know of at AY _____
8. Have you suffered damage/loss due to wildlife in AY? 0. No 1. Yes

9 If yes in answer to question number 8, what damage/loss have you faced due to wildlife? _____

10 Which wild animals are the most problematic with regard to livestock predation at AY?

11 What is the trend of livestock predation by wildlife? 0. Decreasing 1. Increasing

12 Which wild animals are most problematic in terms of crop raiding?

13 What is the tendency of crop damage by wildlife? 0. Decreasing 1. Increasing

14 Have you personally seen Ethiopian wolves (EW) in AY? 0. No 1. Yes

15 How many times have you seen EW in the last 12 months _____ and past 5 years? _____

16 What times of the day you are more likely to see EW? _____

17 What is the largest group of EW you have seen in AY? _____

18 What do you think about the number of EW in AY? 0. Decreasing 1. Increasing. Explain the reasons why you think there is increasing/decreasing number of wolves in AY _____

19 In your opinion, can wolves live harmoniously in the same area with people? 0. No 1. Yes

20 What is your attitude towards wolves? 0. Negative 1. Positive