

Cover Page



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Title: Ecology of the Ethiopian wolf (*Canis simensis* Rüppell 1835) in a changing landscape: Human carnivore interactions in Afroalpine ecosystems of Ethiopia

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Summary

Ecology of the Ethiopian wolf (*Canis simensis* Rüppell, 1835) in a changing landscape: Human carnivore interactions in Afroalpine ecosystem of Ethiopia

Keywords

Attitude, Borena Sayint National Park, economic impact, endangered species, Ethiopian highlands, pastoralists, resource use, rodents, scat analysis

Ethiopian wolves are a globally endangered species with a population of fewer than 500 individuals confined to six fragmented Afroalpine pockets of the Ethiopian highlands. These enigmatic canids subsist on diurnal Afroalpine rodents. But the Afroalpine ecosystem itself is degraded and has gradually diminished in size due to human usage. Thus, Ethiopian wolves now face threats that arise from habitat loss, isolation, their small numbers, disease and the increasing overlap with the human and livestock populations. I investigated both ecological and socio-economic factors influencing the interaction between the Ethiopian wolf, rodent communities and the surrounding human land use in three Afroalpine habitats in Borena Sayint National Park (BSNP), Abune Yosef and the Aboi Gara massifs in the South and North Wollo highlands of Ethiopia. I applied scat analysis, interviews, a questionnaire, group discussion and rodent-trapping survey methods to examine the ecological relationships between plants, animals and people at the study sites, where natural resources are central to local livelihoods.

In BSNP 94.6% of the Ethiopian wolf diet was made up of rodents, medium-sized mammals, birds and plant materials, while only 5.4% comprised livestock. Of all prey consumed, 88.2% were rodents of which 79.2% were diurnal rodents such as *Arvicanthis abyssinicus*, *Lophuromy flavopunctatus*, *Tachyoryctes splendens* and *Otomys typus*. However, the presence of livestock in the wolf scat indicated predation, which is damaging to livelihoods and negatively influences people's perceptions of Ethiopian wolves. Livestock predation is an emerging problem at BSNP that requires the attention of conservationists. In my rodent survey the average rodent density across the study area was 65 individuals per hectare, significantly higher in ungrazed land uses than on grazed land. The common rodent species captured directly and evidenced indirectly in both land uses were *L. flavopunctatus*, *A. abyssinicus*, *Stenocephalemys griseicauda*, *T. splendens* and *O. typus*. Most of these were trapped in mixed meadow habitat followed by 'guassa' grassland. Rodent population density per hectare correlated positively to the percentage of Afroalpine vegetation cover and negatively to the livestock signs present in the area. Overall, livestock

grazing significantly reduced the percentage of ground-level vegetation cover, which rodents use for shelter and food. Careful grazing management at BSNP is therefore important in order to avoid the potential loss of rodent species and to preserve overall Afroalpine biodiversity.

I also surveyed people who obtained economic benefit from and enjoyed unrestricted access to natural resources in Abune Yosef. This included establishing whether or not they support conservation efforts. Abune Yosef is a remnant patch of Afroalpine ecosystem that provides valuable natural resources for the local community and sustains a small population of the endangered Ethiopian wolf. Of the total households interviewed, 80% benefited from natural resources by grazing their livestock and by harvesting firewood, grasses and other materials. However, the majority (90%) suffered from livestock predation by Ethiopian wolves and common jackal as well as crop raiding by gelada baboons, birds and rodents. Nevertheless, more than half of households (66%) reported having a positive attitude toward Ethiopian wolves and many (71%) also recognised the need to protect the Afroalpine habitats of Abune Yosef. Next, I discussed how people's attitudes were modulated by human-wildlife conflicts and by the benefits derived from having access to natural resources in communal land. I also discussed the implications for the conservation of the Afroalpine ecosystem and its flagship species, the Ethiopian wolf.

In Aboi Gara, a massif adjacent to Abune Yosef, the peaceful coexistence of people and the rare Ethiopian wolf is challenged by predation on small stock (sheep and goat) by wolf and other wild carnivores. I interviewed the local pastoralists to understand the socio-economic and cultural influence of this conflict. I assessed the extent and patterns of predation on small stock, its economic impact, and how it may affect people's attitude towards the Ethiopian wolf. Then, I identified measures to ameliorate the conflict between local pastoralists and wild carnivores by avoiding negative attitudes and retaliatory killings of the Ethiopian wolf in Afroalpine relicts. In the study area for example, of 140 pastoralist households, 70 reported losing 131 small stock to wolves and golden jackals over a 12 month period. This averaged 1.2 head of small stock per household, which represents a loss of 10% of the average herd size ($n=12$ small stock), or USD 92 per household. However, 62.1% of the respondents had a positive attitude towards the Ethiopian wolves, particularly literate people and those with smaller herds who had also suffered from fewer losses.

In conclusion, wild carnivore predation on small stock seems to pose a problem in Aboi Gara and nearby highlands, where natural prey has been depleted due to habitat destruction and fragmentation. This conflict carries an economic cost to the local community, and also poses a threat to Ethiopian wolves. To minimise such conflict in Aboi Gara and elsewhere I recommended the following: promoting environmental education to increase tolerance of local communities; creating alternative income sources like communi-

ty-based ecotourism to reduce local economic vulnerability to small stock losses; reducing exploitive resource harvesting from the Afroalpine landscape to encourage the recovery of a healthier rodent prey base for wolves; and implementing better livestock guarding techniques.

