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**Ecology and conservation of spotted hyena (*Crocuta crocuta* Erxleben 1777) in human dominated landscapes in Northern Ethiopia**  
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# 5

## **Hyena (*Crocuta crocuta*) Concentrate around Urban Garbage Dumps in Northern Ethiopia**

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## Abstract

Hyenas live in remarkably close proximity to humans in the degraded and prey-depleted Mekelle district, northern Ethiopia, feeding on waste and to a lesser degree on livestock. We surveyed spotted hyena abundance in two garbage dumps and two open natural areas. Four callups were performed, giving a minimum population estimate of 157 hyenas; all but one in open natural areas. This confirms that the presence of hyena is restricted to garbage dumps. Tolerated as efficient means of sanitation, spotted hyenas remove waste from butchers and households from the city and this contributes substantially to their persistence. Our findings confirm 'commuting' movements and raise questions about local hyena social structure.

## 5.1 Introduction

Hyena is the most common large carnivore in the highlands and lowlands of Ethiopia, Eritrea, and Somalia (Gade, 2006). Despite a certain amount of depredation, spotted hyenas have been tolerated when scavenging from domestic waste, abandoned traction animals and, during famine and armed conflict, people (Gade, 2006). Hyenas are known to occur in prey-depleted areas across Ethiopia. Hyenas are reported to avoid villages in areas where they are persecuted (Croes et al., 2011). However, in many parts of their range, they occur in close association with human habitations (Mills & Hofer, 1998; Woodroffe, 2001). They live in remarkably close proximity to humans in Mekelle district, northern Ethiopia, feeding on waste and to a lesser degree on livestock, but not on natural prey (Abay et al., 2011).

Population size is a key ecological parameter for understanding the biology and conservation status of a species (Williams et al., 2002). Robust estimates of hyena abundance in Ethiopia have not been published, although some studies are currently in progress by our research team. Data on environmental factors influencing hyena abundance are also limited.

We previously reported that hyenas get most of their food from scavenging on urban and rural waste; scat analysis at small forest patches within 10 km of Mekelle showed that depredation accounted for less than 20% of food intake (Abay et al., 2011). Based on our previous experience and personal observations, we hypothesized that hyena 'commute' between rural forest fragments in the daytime ('church forests', Aerts et al., 2007) and urban food sources at night. As a consequence, hyena abundance would be higher at

the garbage dumping sites than in other open urban areas. We thus aimed to identify key ecological factors influencing hyena abundance and distribution within close proximity of Mekelle, northern Ethiopia.

### 5.2 Study area

The study was conducted in the vast growing city of Mekelle (regional capital, 200,000 inhabitants) located in northern Ethiopia at an elevation of about 2,230 m a.s.l. Its size increased from 16 km<sup>2</sup> in 1984 to over 100 km<sup>2</sup> in 2004 (Tadesse et al., 2008). For waste disposal, households use communal containers, dumps in open areas and along roadsides, and burning. With the expansion of the city, there is growing pressure on municipal services such as waste collection and disposal. Household solid waste collection and disposal in the city of Mekelle is largely the responsibility of the municipality (Tadesse et al., 2008). There were two dumping sites during the study period, i.e., Adikolemey and Kelamino, both directly on the edge of town.

Average annual rainfall of the area is about 550 mm. The mean maximum temperature ranges between 12 °C and 27 °C. The area is a barren landscape with some eucalyptus (*Eucalyptus camaldulensis*) and cactus (*Opuntia ficus-indica*) vegetation and hardly any large or medium-sized natural prey. There are forest fragments around the many churches scattered throughout the region, however; these are the so-called ‘church forests’ (Aerts et al., 2007). The remains of slaughtered animals and all redundant pack animals create an abundant food resource for hyenas in and around Mekelle city.

### 5.3 Methods

Two garbage dumps (Adikolemey and Kelamino) and two open natural areas (Mesebo and Kiha), each >10 km apart were selected in consultation with the municipality workers of Mekelle city. This avoided double counting of spotted hyenas. Minimum hyena population size was established with a calling station at each site (Ogutu & Dublin, 1998; Mills et al., 2001; Bauer, 2007; Abay et al., 2011) between 18:00 and 22:00. Continuous gnu-hyena distress and hyena sounds were played for one hour on an MP3 player connected to a megaphone (Monacor 45) positioned on top of a vehicle. The speaker was rotated every 15 minutes. Responding hyenas were counted in the dark, based on sounds and with a spotlight during several short count-

ing sessions, taking the maximum number observed during any counting session as the minimum population size.

## 5.4 Results

A total of 158 hyenas responded to four different callups; 81 at Adikolemey and 76 at Kelamino, and one in the open area (Table 5.1). Spotted hyenas at the two dumps were congregations from various directions, apparently fusing without aggression.

**Table 5.1**  
Total number of responding hyenas in garbage dumps and open areas of Mekelle in 2011 based on four callups

Calling station	Count (%)	Site
Adikolemey	81(51.3)	Garbage collection
Kelamino	76(48.1)	Garbage collection
Mesebo	1(0.6)	Open area
Kiha	0(0)	Open area
<b>Total</b>	<b>158(100)</b>	<b>4</b>

## 5.5 Discussion

Our study supports our commuting hypothesis that hyenas commute between protected church forests during the day and waste dumping sites at night and previous inference that hyenas in northern Ethiopia survive partly through depredation but more importantly through scavenging on (peri-) urban waste (Abay et al., 2011). This is in stark contrast with findings in other parts of Africa, where hyenas are reported to avoid human settlements as a result of persecution (Croes et al., 2011). The relative abundance of hyenas in garbage dumping sites reflects their dependence on anthropogenic food sources rather than natural prey in the district. Urban waste availability and distribution influenced spatial distribution and abundance of hyenas in the district. This is remarkable, as other studies demonstrated consistent avoidance of human settlements by hyena (Croes et al., 2011). Our study raises the question how such commuting between rural church forests and urban dump sites affects social structure, such as territoriality and clan or kinship relationships.

Information on the feeding ecology of large carnivores contributes substantially to the understanding of their behavioral ecology (Mills, 1992). Waste from butchers and households appears to be a key ecological factor influencing the abundance and distribution of spotted hyenas within close proximity of human settlements. Hyenas are highly adaptable to human behavior. In contrast, Croes et al. (2011) reported hyena avoidance of human settlements because of retaliatory killings following livestock depredation. Documentation of such changes in abundance and distribution is important for the development of our understanding of human-hyena interactions and the extent to which spotted hyenas can adapt to human presence. Such changes in hyena abundance and distribution within close proximity of human settlements can potentially be used as indicators of the extent and severity of natural prey depletion and human disturbance. Waste provides an alternative food sources for spotted hyenas, which are locally regarded as “municipal workers”.

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