

Human-Ethiopian Wolf Conflict in and Around the Simien Mountains National Park, Ethiopia

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ABSTRACT

Information on the attitude of local people on the Ethiopian wolf in and around the Simien Mountains National Park was collected between September, 2005 and March, 2006 by means of face-to-face questionnaire survey and faecal dropping analysis. Data were analyzed using descriptive statistics and responses compared using Chi-square test and one-way ANOVA. Logistic regression model was used to analyze the attitude of respondents towards the Ethiopian wolf. The analysis indicated that 73.1% of the respondents had positive attitude towards the Ethiopian wolf. On the other hand, 18.3% of the respondents reported the loss of sheep to the Ethiopian wolf. Distance from the Park and sheep predation were not related ($r = 0.06$, $P > 0.05$). However, when considering the distance from the Ethiopian wolf habitat, there was a negative correlation ($r = -0.44$, $P < 0.05$) between sheep loss to the Ethiopian wolf and distance from the habitat of the Ethiopian wolf. There was a positive correlation ($r = 0.17$, $P < 0.05$) between predation by the Ethiopian wolf and the number of sheep in the area. The faecal droppings of the Ethiopian wolf revealed that 97.8% constituted rodent species. The average sheep loss by the Ethiopian wolf per year per household was 0.62 ± 0.09 . Based on this proportion, there is minimal conflict between the local people and the Ethiopian wolf in the study area. However, concerned organizations should take coordinated measure to conserve the population of Ethiopian wolf and reduce such conflict even if it occurs at a minimal level.

Key Words: Wildlife Conflict, Ethiopian wolf, Simien Mountains.

INTRODUCTION

The Ethiopian Wolf (*Canis simiensis*) (Rüppell 1835) is one of the most endangered endemic species of Ethiopia. It mainly lives in the Afro-alpine habitats that are characterized by short grasslands (Sillero-Zubiri and Gottelli 1995). It feeds on small mammals, mainly rodents such as the giant mole rat (*Tachyoryctes macrocephalus* Ruppell 1842), the common mole rat (*T. splendens* Ruppell 1836) and the grass rat species (*Arvicanthis abyssinicus* Ruppell 1842, *A. blicki* Frick 1914, *Lophuromys melanonyx* Petter 1972 and *Otomys typus* Heuglin 1877). This type of feeding behaviour makes the species unique compared to the other carnivores. Besides the rodent species, the Ethiopian wolf has been rarely observed chasing and feeding on young antelopes, lambs and hares (Sillero-Zubiri 1994).

The Ethiopian wolf is probably the rarest canid in the world with fewer than 500 adult individuals surviving (Sillero-Zubiri and Macdonald 1997). It occurs in a few mountain ranges of the Ethiopian highlands, the Simien Mountains, mountain tops of the Wollo highlands around Abune Yoseph, Amba Ferit, Donkoro Chaka and other high altitude areas of the Wollo region and in north Shoa area of Menz (Guassa). It also occurs in Arsi and the Senatti plateau of Bale Mountains and other high altitude areas (Marino 2003, Ashenafi et al. 2005).

Naturally, organisms live together in a given ecosystem for a long period of time. Then, through time, they show high degree of intrinsic stability and resilience to climate and other environmental factors in the given ecosystem. However, when humans enter these systems, the natural phenomena become disturbed resulting in human-wildlife conflict (Messmer

2000). Human-carnivore conflict occurs when the carnivore population increases or human encroaches into their habitats. Cattle raiding by carnivores might occur in such regions, resulting in economic loss to settlers in and around forested areas. People often respond to this by poisoning, shooting and trapping that also might affect non-target animals in high proportion (Treves et al. 2003). Killing of livestock by wild predators can cause problems and this is prominent in villages near forests where extensive livestock husbandry is practiced (Oli et al. 1994). The conservation attitude of local community living adjacent to the protected areas is highly influenced by the problems they face in association with the wildlife. People living surrounding the protected areas are unable to control the losses caused by wildlife and are likely to develop negative attitude towards wildlife (Newmark et al. 1993, 1994). Especially, in communities with a subsistence economy, even small losses can generate strong negative attitude towards wildlife (Oli et al. 1994).

The main objective of the present paper is to reveal the degree of conflict between the Ethiopian wolf and the local people living in and around the Simien Mountains National Park and to assess the attitude of the local people towards the Ethiopian wolf.

THE STUDY AREA

The Simien Mountains National Park (SMNP) is part of the Simien Mountains (between $38^{\circ}00' - 38^{\circ}12' E$ and $13^{\circ}12' - 13^{\circ}19' N$) located in the North Gondar Zone (Figure 1). This area is part of the Simien massif, which includes Ras Dejen, the highest peak in Ethiopia (4,543 m above sea level). SMNP represents one of the most marvelous natural areas and due to its unique features, it is considered as one of the World Heritage Sites (Falch and Keiner 2000).

The climate of SMNP varies from area to area but, generally, the highlands have a relatively low temperature. The temperature of SMNP shows high diurnal variability. The annual rain fall ranges from 1350 to 1600 mm (Dunbar 1978).

The rich natural vegetation of SMNP exists due to the steep gorges. It mainly consists of a mixture of Afro-alpine woods, heath forest, high mountain vegetation, montane savannah and montane moorland (Hurni and Ludi 2000). About 57 tree species and herbaceous plants have been recorded from this area. There are over 20 endemic plant species within and in the buffer zone of the SMNP. Of these, *Festuca gilbertiana* Alexeev ex S.M. Philips 1994, *Rosularia simiensis* Ohba 1978 and *Dianthus longiglumi* Del.1843

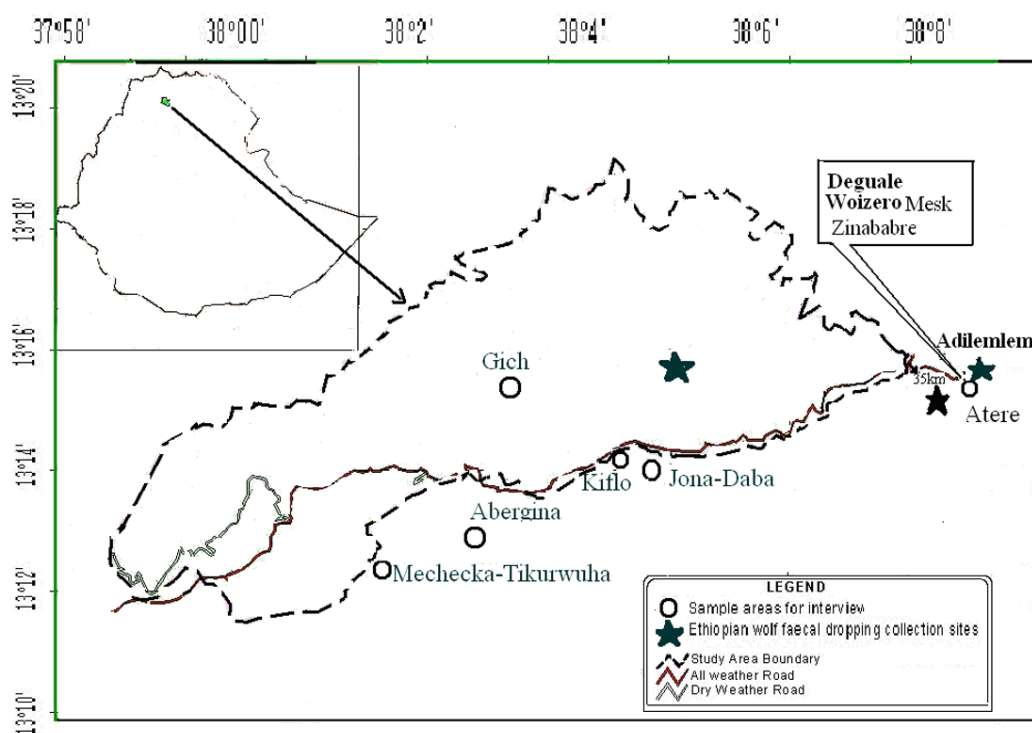


Figure 1. Map of the Simein Mountains National Park and the study area.

are exclusively endemic to the Simien Mountains (Falch and Keiner 2000). In addition to this, it also harbours large number of animals. Among the major fauna, 22 large mammals, 13 small mammals and 180 bird species have been recorded (Hurni 1986). The rich floral and faunal composition of the park has been extensively exploited by the local community. According to Falch and Kiener (2000), about 86% of the Park is used for various purposes by humans at various levels of intensity, including farming which comprises the largest percentage.

METHODS

Initially, a pilot survey was carried out in selected study areas. The main purpose of the pilot survey was to identify the area where the conflict between local people and the Ethiopian wolf occurs. During the pilot survey, a total of 46 individuals were randomly selected and interviewed.

A total of 300 people were interviewed using questionnaire. Of these, 72 respondents were females and 228 were males. The questionnaire included both open-ended and fixed response questions. Open ended questions were included to elicit information on knowledge about wildlife in the area, whether the Ethiopian wolf posed any problem in the community and to identify the attitude of the local people towards the Ethiopian wolf. A series of supplementary questions were also used in the questionnaire to gather personal and socio-economic information at the level of individual respondents. Using the questionnaire, interviews were conducted in eight randomly selected villages (Abergina, Gich, Mecheka-Tikurwuha, Kiflo, Jona-Daba, Deguale, Zinababre, and Woizero Mesk) (Figure 1). These villages were selected based on the information gathered using the pilot survey. Gich was located in the Park, whereas Deguale, Zinababre, and Woizero Mesk were located very far away from the Park. The remaining villages were located within the buffer zone. The respondents were selected on the basis of chance encounter by the interviewer (Newmark, et al. 1993).

A total of 73 faecal samples of the Ethiopian wolf were collected from the study area. The date of collection, altitude of the collection site, location and approximate age of the faeces were recorded. The age of faecal samples was categorized into fresh (1 day old), recent (2-5 days old) and old (above 5 days) following Breuer (2005). Identification of the carnivore faeces

was carried out based on shape, colour, ingested hair, diameter and odour (Breuer 2005). The faecal droppings of the Ethiopian wolf, common jackal (*Canis aureus* Linnaeus 1758) and other related carnivores in the area were distinguished using the shape and colour of the faeces. Faecal samples located close to each other were not considered to avoid collection from the same individual. The faecal samples of the Ethiopian wolf were sun dried, washed and filtered in a sieve (1 mm) to separate hairs, bones, teeth and other prey components from other organic matters. The separated hairs were washed in acetone, dehydrated in 100% ethanol and dried on a filter paper. The hair samples were observed under a microscope and form, length and colour were recorded following Breuer (2005).

Data were analyzed using descriptive statistics and responses compared using Chi-square test and one-way ANOVA. Tukey test was used to identify the real difference after a one-way ANOVA test. For the data gathered using questionnaire, logistic regression was used to determine which factors might be important in determining the attitudes of respondents expressed as positive or negative responses. For this, using variables like age, sex, educational level, village and family size of the respondents, distance from the park and whether conserving wildlife is good / bad were entered as explanatory variables.

RESULTS

Livestock rearing and farming are the major economic activities of people living in and around the SMNP. The major livestock kept by the community in the area are cattle, sheep and pack animals (horse, mule and donkey). Most (69.4%) household had sheep and goats. Sheep ownership ranged from 0 to 50 among respondents. Among the respondents, 75.7% owned cattle whereas 69.0% owned pack animals.

Among the respondents, 18.3% lost sheep to the Ethiopian wolf alone and 8.0% lost sheep to both the Ethiopian wolf and common jackal in the last ten years. The average sheep loss by the Ethiopian wolf per year per household was 0.62 ± 0.09 . Villages differed ($F = 6.66$, $df = 7, 292$, $P < 0.001$) in terms of loss of sheep. Significant difference was observed when Kiflo was compared with Mecheka-Tikurwuha ($P < 0.001$), Abergina ($P < 0.01$) and Deguale ($P < 0.01$) (Figure 2).

Sheep loss to the Ethiopian wolf differed based on the distance of village from the Park ($\chi^2 = 33$, $df = 6$, $P < 0.001$). However, the Ethiopian wolf also occurs

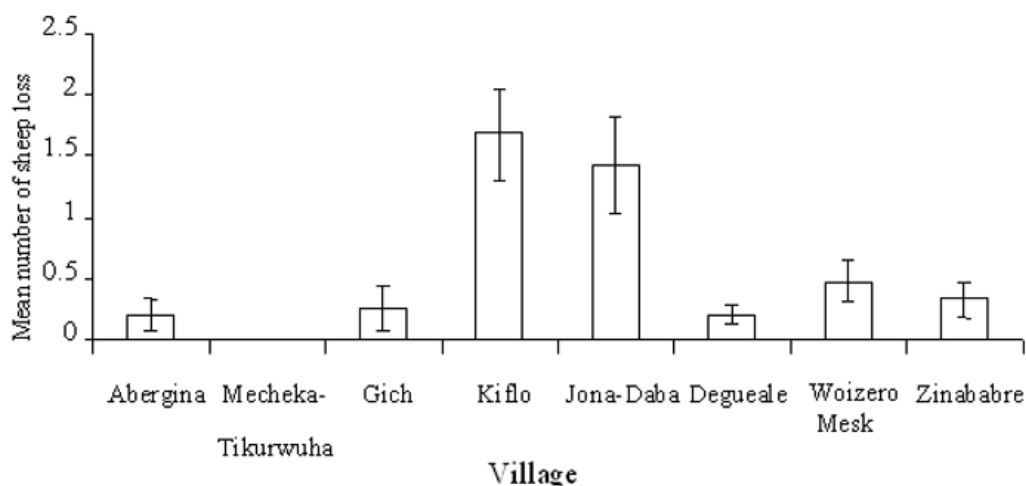


Figure 2. Mean \pm SE in the number of sheep predated per house hold per year.

outside the Park around Deguale, Woizero Mesk and Zinababre villages (Table 1). Distance from the Park and sheep predation were not related ($r = 0.06$, $P > 0.05$). However, when considering the distance from the Ethiopian wolf habitat, there was negative correlation ($r = -0.44$, $P < 0.05$) between sheep loss to the Ethiopian wolf and distance from the habitat of the Ethiopian wolf. There was also positive correlation ($r = 0.17$, $P < 0.05$) between predation by the Ethiopian wolf and the number of sheep present in the area.

Predation by the Ethiopian wolf was not as such pronounced in the study area. But, still it is possible to see the trend of predation from the recorded loss in the last ten years. Villages differed ($\chi^2 = 140.4$, $df = 21$,

$P < 0.001$) in the trend of predation by the Ethiopian wolf. Among the respondents from Zinababre, 33.3% reported an increasing trend of predation whereas those among Woizero Mesk revealed a decreasing trend (Table 2).

Faecal analysis revealed that the majority of the prey (97.8%) constituted rodents ($\chi^2 = 128.6$, $df = 2$, $P < 0.001$). Only 1.1% contained sheep hair and the remaining 1.1% contained both rodent and sheep hair samples.

The occurrence of prey type showed no significant difference ($\chi^2 = 3.34$, $df = 4$, $P > 0.05$) between different collection sites. All the faecal droppings from Gich-Aynameda (100%), Atere (100%) and most (93.3%) from Adilemlem contained rodent preys (Table 3).

Table 1. Sheep loss to the Ethiopian wolf in relation to distance from the park.

Distance	No. of respondents	% predation	Ethiopian wolf (%)	Ethiopian wolf + common jackal (%)
Inside park	37	91.9	2.7	5.4
<1 km	79	59.5	27.8	12.7
1-5 km	84	89.3	4.7	6.0
>5 km	100	65.0	28.0	7.0
Total	300	73.7	18.3	8.0

Table 3. Attitude towards the Ethiopian wolf.

Village	No. of respondents	negative attitude (%)	positive attitude (%)
Abergina	42	21.4	78.6
Mecheka-Tikurwuha	35	42.9	57.1
Gich	37	18.4	81.6
Kiflo	44	25.0	75.0
Jona-Daba	42	28.6	71.4
Deguale	34	45.5	54.5
Woizero Mesk	33	21.2	78.8
Zinababre	33	12.1	87.9
Total	300	26.9	73.1

Table 2. Trend of predation by the Ethiopian wolf among different villages.

Village	No. of respondents	Predation (%)	Increasing (%)	Decreasing (%)	Unknown (%)
Abergina	42	97.6	2.4	0.0	0.0
Mecheka-Tikurwuha	35	100.0	0.0	0.0	0.0
Gich	37	94.7	2.7	2.6	0.0
Kiflo	44	47.7	25.0	27.3	0.0
Jona-Daba	42	57.2	23.8	19.0	0.0
Deguale	34	66.7	3.0	30.3	0.0
Woizero Mesk	33	33.3	18.2	33.3	15.2
Zinababre	33	18.2	33.3	30.3	18.2
Total	300	65.3	13.7	17.3	3.7

Among the respondents, 73.1% had a positive attitude towards the Ethiopian wolf. However respondents from different villages differed in their attitude towards the Ethiopian wolf ($\chi^2 = 16.8$, $df = 7$, $P < 0.05$). Most respondents from Abergina (78.6%), Gich (81.6%), Kiflo (75%), Jona-Daba (71.4%), Woizero Mesk (78.8%) and Zinababre (87.9%) had positive attitude towards the Ethiopian wolf (Table 3). On the other hand, 42.9% of the respondents from Mecheka-Tikurwuha and 45.5% from Deguale had negative attitude. There was no correlation ($r = -0.04$, $P > 0.05$) between livestock predation by the Ethiopian wolf and attitude of respondents towards the Ethiopian wolf.

The General Linear Model for the factors to determine the attitude of respondents towards the Ethiopian wolf explained 56.4% of the variance, and the likelihood ratio of goodness of Fit Test just fitted the model ($P < 0.001$). Only the variable whether conserving wildlife is good/bad was important in determining the attitude towards the Ethiopian wolf. Those with positive attitude towards wildlife in general had more positive attitude towards the Ethiopian wolf.

DISCUSSION

The conflict between the Ethiopian wolf and the local people in the present study area was not significant, because the Ethiopian wolf feeds largely on rodents. According to Sillero-Zubiri (1994), the Ethiopian wolf is a specialist rodent hunter adapted to prey upon the dense population of diurnal rodents occurring in the Afro-alpine grassland habitats. The present finding showed only 18.3% of respondents reported sheep loss

to the Ethiopian wolf (Table 1). Similar result was obtained by Ashenafi (2001) and Ashenafi et al. (2005) which revealed only 14.5% of the respondents reported sheep loss to the Ethiopian wolf in Guassa area. Similarly, 20.5% of respondents reported having suffered from sheep depredation by the Ethiopian wolf in the last ten years in the same study area (Dejene 2003). In addition, based on the result from the faecal dropping analysis, 97.8% of the total faecal dropping samples accounted for rodent prey and only 1.1% accounted for sheep (Table 3). Another study in the Bale Mountains National Park also showed that rodents accounted for 96% of all prey occurrences in the Ethiopian wolf faecal droppings (Sillero-Zubiri 1994). The reason for the less number of sheep loss to the Ethiopian wolf is that the distribution of the Ethiopian wolf is limited and its number is also very low in the study area.

Distance from the Park was not correlated with sheep loss to the Ethiopian wolf. However, in considering the distance from the Ethiopian wolf habitat, there was a negative correlation between sheep loss to the Ethiopian wolf and distance from the habitat of the Ethiopian wolf. Those who live close to the habitat of the Ethiopian wolf, lost more sheep than those who live at far distance from the habitat of the Ethiopian wolf. The Ethiopian wolf also occurs far from the Park boundary around Deguale, Woizero Mesk and Zinababre. Even though these three villages are far from the Park boundary, they are nearer to the habitat of the Ethiopian wolf and hence sheep loss of 28% is recorded. Furthermore, 27.8% of the respondents who lived very close to the park (< 1 km) lost sheep to the Ethiopian wolf (Table 1). Based on the present

findings, 13.7% of the respondents reported the trend of predation to the Ethiopian wolf is increasing, whereas 17.3% reported the trend decreasing. This might be associated with the decrease in the number of the Ethiopian wolf.

Most (73.1%) respondents from all villages had positive attitude towards the Ethiopian wolf (Table 3). There was no correlation between predation by the Ethiopian wolf and attitude of the local community towards the Ethiopian wolf. Therefore, attitude towards the Ethiopian wolf did not depend on sheep loss. The logistic regression model predicted that only those respondents who had positive attitude towards wildlife conservation had positive attitude towards the Ethiopian wolf. But, factors like age, sex, educational level, family size, village, distance from the Park and the presence and absence of sheep loss to the Ethiopian wolf were not determinant factors for the attitude of respondents towards the Ethiopian wolf. The negative attitude towards the Ethiopian wolf in Mecheka-Tikurwuha was not related to sheep loss because the distribution of the Ethiopian wolf was not around such village and hence no predation occurred.

Many respondents living in and around the SMNP considered that the Ethiopian wolf is an endemic species and an important source of income for the country. Similarly, according to Ashenafi (2001), large number of residents from Guassa area knew that the Ethiopian wolf is an endemic species. In addition, as reported by Dejene (2003), the Ethiopian wolf has the potential to attract tourists and bring income to their respective areas. A study in Minnesota, showed that there was strong positive attitude towards timber wolf and agreed that timber wolf was symbolic of nature's wonder and beauty (Kellert 1985).

Even though there is limited conflict between the local people and the Ethiopian wolf, some measures should be taken to mitigate the loss of sheep to the Ethiopian wolf. Conservation measures should also be taken to increase the number of the Ethiopian wolf population in the study area by encompassing additional areas. It is already suggested that to evolve a more meaningful strategy for management and sustainable utilization of wildlife, wildlife management policies should be directed to enhance incorporation of expertise and views of the local people (Balakrishnan and Ndhlovu, 1992). Considering the unique topography of the Simien Mountains and the rare and endemic status of the Ethiopian wolf, the wildlife management programme of the Park should incorporate the views of the local communities who

have been responsible for maintaining the area traditionally with its magnificent wildlife forms since time immemorial. As envisaged earlier, they should also be able to share the benefits out of conservation efforts (McNeely and Miller 1984, McKinnon et al 1986)

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REFERENCES

- Ashenafi, Z.T. 2001. Common Property Resource Management of an Afro-Alpine Habitat: Supporting a Population of a Critically Endangered Ethiopian Wolf (*Canis simensis*), PhD. Thesis, Durrel Institute of Conservation and Ecology, University of Kent, Kent. 300 pages.
- Ashenafi, Z.T., Coulson, T., Sillero-Zubiri, C. and Leader-Williams, N. 2005. Behavior and ecology of the Ethiopian wolf (*Canis simensis*) in a human-dominated landscape outside protected areas. *Animal Conservation* 8: 113-121.
- Balakrishnan, M. and Ndhlovu, D.E. 1992. Wildlife utilization and local people: A case-study in Upper Lupande Game Management Area, Zambia. *Environmental Conservation* 19: 135-144.
- Breuer, T. 2005. Diet Choice of Large Carnivores in Northern Cameroon. *African Journal of Ecology* 43: 97-106.
- Dejene, D. 2003. Attitudes and Perception of Local Community Towards the Ethiopian Wolf. MSc. Thesis, Durrell Institute of Conservation and Biology (DICE). University of Kent. 63 pages.
- Dunbar, R.I.M. 1978. Competition and Niche Separation in a High Altitude Herbivore Community in Ethiopia. *East African Wildlife Journal* 16: 183-199.
- Falch, F. and Keiner, M. 2000. Simien Mountains National Park Management Plan, Final Draft (unpublished). Amhara National Regional State, Bahir Dar. 285 pages.
- Hurni, S.J. 1986. Management Plan: Simien Mountains National Park and Surrounding Rural Area. UNESCO World Heritage Committee, Gland. 122 pages.
- Hurni, H. and Ludi, E. 2000. Reconciling Conservation with Sustainable Development. University of Berne, Berne. 180 pages.
- Kellert, S.R. 1985. Social and Perceptual Factors in Endangered Species Management. *Journal of Wildlife Management* 49: 528-536.

- MacKinnon, J., MacKinnon, K., Child, D. and Thorsell, J. 1986. *Managing Protected Areas in the Tropics*. IUCN/UNEP, Gland. 295 pages.
- McNeely, J.A. and Miller, K.R. (Editors) 1984. *National Parks, Conservation and Development: the Role of Protected Areas in Sustaining Society*. Smithsonian Institution Press, Washington, DC. 825 pages.
- Marino, J. 2003. Threatened Ethiopian wolves persist in small isolated Afro-alpine enclaves. *Oryx* 37: 62-71.
- Messmer, T.A. 2000. The Emergence of Human-Wildlife Conflict Management: Turning Challenges into Opportunities. *International Biodeterioration* 45: 97-102.
- Newmark, W.D., Leonard, N.L. Sarko, H.I., and Gemassa, D.M. 1993. Conservation Attitude of Local People Living Adjacent to Five Protected Areas in Tanzania. *Biological Conservation* 63: 177-183.
- Newmark, W.D., Manyanza, D.N., Gamassa, D.M., and Sariko, H.I. (1994). The Conflict between Wildlife and Local People Living Adjacent to Protected Areas in Tanzania: Human Density as a Predictor. *Conservation Biology* 8: 249-255.
- Oli, M.K., Taylor, I.R., and Rogers, M.E. 1994. Snow Leopard *Panthera unica* Predation of Livestock: An Assessment of Local Perception in the Annapurna Conservation Area, Nepal. *Biological Conservation* 68: 63-68.
- Sillero-Zubiri, C. 1994. Behavioral Ecology of the Ethiopian Wolf (*Canis simensis*), PhD. Thesis, University of Oxford, Oxford. 283 pages.
- Sillero-Zubiri, C. and Gottelli, D. 1995. Diet and Feeding Behavior of Ethiopian Wolves (*Canis simensis*). *Journal of Mammalogy* 76: 531-541.
- Sillero-Zubiri, C. and Macdonald, D. W. 1997. The Ethiopian wolf: Status Survey and Conservation Action Plan. IUCN/ SSC Specialist Group. 123 pages.
- Treves, A., Naughton-Treves, L., Harper, E.K., Mladenoff, D.J., Rose, R.A., Sickely, T.A., and Wydeven, A.P. 2003. Predicting Human-Carnivore Conflict: A Spatial Model Derived from 25 Years of Data on Wolf Predation on Livestock. *Conservation Biology* 18: 114-125.