

Full Length Research Paper

Abundance of hamadryas baboon (*Papio hamadryas hamadryas*) and conflict with humans in Awash National Park, Ethiopia

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A study on population size of hamadryas baboon (*Papio hamadryas hamadryas*) and its conflict with people was carried out from August 2011 to December 2013 in Awash National Park, Ethiopia. Abundance was estimated using total count method at five counting sites. To assess the species conflict with humans, questionnaires and structured interview methods were used. Data were analyzed using descriptive statistical methods SPSS version 15. The total number of individuals from August 2011 to November 2013 was 1581 and 1845, respectively. Abundance has no significant difference between wet and dry seasons ($P < 0.05$). There was no significant difference between the population of hamadryas baboon in 2011/2012 and 2013 ($P < 0.05$). There was no significant change in the rate of change in the population ($P < 0.05$). However, there was significant difference between male and female population of hamadryas baboon in 2011/2012 ($P < 0.05$). In 2012/2013 count, the number comprised of 26% adult male, 19% adult female, 9% sub-adult male, 14% sub-adult female, 11% juvenile male, 18% juvenile female and 3% infants. The proportion of female population was more in all age groups except for infants where sex identification was not possible. The species in the study area was highly influenced by forage resource distribution and hence, the high proportion of individual number was found in the northern part of the park, where more forage was available. The result of human survey showed that the overwhelming number (93%) of respondents felt that there was high conflict between people and hamadryas baboon. 92% of the respondents also noted that there was habitat encroachment including deforestation, overgrazing, charcoal production for fuel, and vegetation clearance for settlement in the park. Moreover, majority of the respondents witnessed frequent killing of baboons by farmers as a measure against alleged crop raiding by the species and also considerable number of species are killed by reckless vehicle and truck drivers on the high way crossing the park. About 64% of the respondents also felt that little was done by the park authority to create awareness on the local people about the economic and ecological benefits of wildlife species. Therefore, to minimize human-hamadryas baboon conflict, conservation measures that would ease human encroachment pressure on the habitat and increased local people's awareness should be practiced.

Key words: Abundance, conflict, conservation, hamadryas baboon, park.

INTRODUCTION

Hamadryas baboon (*Papio hamadryas hamadryas*) is distributed along mountainous areas of northeastern Africa and southwestern Arabia. However, in Ethiopia

hamadryas baboon lives in semi-desert areas of Awash National Park, particularly in Filwoha area (Kummer, 1968; Swedell, 2002). Hamadryas baboon also lives at

higher altitudes during scarcity of resources (Kummer, 1968; Biquand et al., 1992b; Zinner et al., 2001a). Once the distribution of hamadryas baboon was widespread but gradually the distribution declined in the ranging countries and at present it is highly restricted to certain areas of the ranging countries in the northeastern Africa and southwestern Arabia. The current distribution of hamadryas baboon is in the eastern Ethiopia, Eritrea and Sudan, western Djibouti and Somalia, southwestern Saudi-Arabia and Yemen (Kummer, 1968; Kummer et al., 1981; Wolfheim, 1983; Schreier, 2010). Even though, the geographical distribution is limited to northeastern Africa and southwestern Arabia, hamadryas baboon is considered as a least concern (IUCN, 1996). Hamadryas baboon was abundantly found in Egypt in recent past, however at present it is locally extinct from Egypt (Winney et al., 2004). The restricted geographical distribution may be due to habitat loss through agricultural expansion, deforestation affecting the food resources, human settlement in and around the habitats of the baboons, hunting for meat and biomedical research, conflict between the baboons and farmers (Zinner et al., 2001a). The distribution of hamadryas baboon is highly influenced by the abundance, availability and distribution of resources like sleeping cliffs and water holes (Kummer, 1971; Schreier and Grove, 2010). The conflict among the farmers, pastoralists and hamadryas baboons may be due to crop raiding and killing young goats and lamb. The original habitats of the baboons have been taken by the farmers and pastoralists for agricultural activities resulting in the current conflict. The farmers highly curse the baboons for raiding their crops (Horrocks and Baulu, 1994; Hill, 1997, 2000, 2005; Chalise and Johnson, 2005). The farmers kill the baboons to protect their crop and young goats and lamb (Naughton-Treves, 1998). In Saudi-Arabia, hamadryas baboons are given food by people. However, the natural behaviour of these baboons may change through time because they can access food resources easily without travelling long distances to search, locate and forage (Biquand et al., 1992b; Al-Safadi, 1994).

In parts of Ethiopia, the distribution of hamadryas baboon includes agricultural areas as a result, the species move to agricultural fields, raid crops and considered as crop raiders (IUCN, 1996). Although, hamadryas baboons are least concern species, in Ethiopia there is hamadryas-human conflict because of habitat loss as well as deforestation for charcoal, over grazing, hunting and settlement in the park. The nomadic pastoralists living in the Park as well as in the proximal areas of the park kill and hunt the baboons because they raid commercial sugarcane plantations and other agricultural crops of the local farmers (IUCN, 2010). The conflict between

hamadryas baboons and the local community is increasing because new farmers have been involved in sedentary agriculture from nomadic pastoralists to improve their livelihood. The population status of hamadryas baboon has never been well studied and there is insufficient demographic data except for social organization and structure (Yalden et al., 1977). Although, hamadryas baboons occur in different parts of Ethiopia, the population size has never been studied and determined (Mori and Gurja, 1990). Therefore, this study is aimed to 1. Assess population size of hamadryas baboon at Awash National Park (ANP). 2. Examine distribution of hamadryas baboon in relation to habitat suitability. 3. Survey people's view and attitudes towards their conflicts with hamadryas baboon.

Study area

ANP is located between latitudes 8°46' N and 9°16' N and longitudes 39°46' E and 40°6'E with its southern boundary along the Awash River. It is about 225 km east of the capital city, Addis Ababa, and covers 589 km² of *Acacia* woodland and grassland area in semi-desert area (EWCA, 2012). Its altitudinal elevation ranges from 1200 to 1829 m asl. Daily temperature ranges from 10 to 22°C. Temperatures can reach as high as 40°C but nights are cooler. On average, December is the coldest month and May is the hottest month of the year. The main rainy season is from June to September, with a short rain from February to April. Most part of the park consists of open plains, short grass savanna and thorn scrub, dominated by Mount Fentale and a spectacular dormant volcano. Among the mammals, hamadryas and anubis baboons are among the commonest ones in the park. Hamadryas baboons are distributed along the northern part of the park particularly in Filwoha area where four of the study sites were located (Figure 1).

MATERIALS AND METHODS

Data collection

The study was conducted from August 2011 to November 2013 both during wet and dry seasons for ten days every month. To study and determine the abundance and structure of hamadryas baboon, a total count method was used (Beehner et al., 2007). Total direct count was carried out at five different counting sites, namely Wasero, Filoha, Urulie, Dahilebora and Fentale cliffs (small cliffs behind Dahilebora cliff) used by the baboons as sleeping sites (Figure 1). Habitat suitability was assessed through repeated observation of the baboons ranging and travel patterns in search of forage resources on daily basis. Population count was carried out four times during each wet and dry seasons in two years period. To

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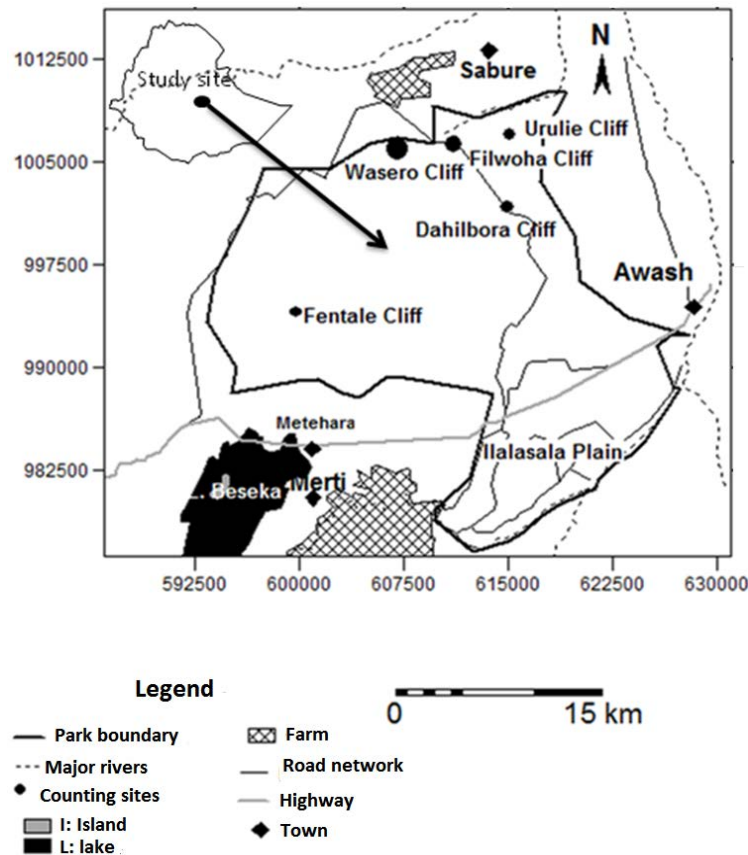


Figure 1. Map of Awash National Park with locations of counting sites of hamadryas baboon.

carry out direct count, ten individuals were employed, excluding the researcher. Hence, two individuals were assigned to count at each counting sites simultaneously early in the morning at 6:00 a.m. and late afternoon from 5:00-6:30 p.m. when the baboons were at their sleeping sites (or resting sites). Usually hamadryas baboons stay at their sleeping cliffs late afternoon from 5:00-6:00 am and leave their cliff to forage early in the morning around 6:00 a.m. (Kummer, 1968; Schiere, 2010). Double counting is minimized following their behaviour of movement. Standardized check lists (that is used for recording the number of individuals) were used to collect data. For the baboon and human conflict assessment, interviews were carried out using questionnaires on randomly selected respondents. The questionnaires were then translated to local language. The structured questionnaire was developed to inquire on range of issues related to baboon and human conflicts. Accordingly, randomly selected respondents (males 188, females 49), local community members (4.2% of the total members), 8 scouts (3.4%), 3 park administrators (1.3%), 4 district administrators (1.7%), 10 students (4.2%), 120 pastoralists (50.6%), 80 farmers (33.8%), 2 visitors (0.84%) were interviewed by the help of enumerators. Sample size of respondents was 237 (Table 1). Structured interview was used to interview randomly selected interviewees in the park as well as in district administrator offices by the researcher alone. The sample size of the interviewees was 22 (Table 2).

Data analysis

The data were analyzed using descriptive statistical methods which

were coded and entered into SPSS version 15 software to generate the required results.

RESULTS

Population size, sex and age structure of hamadryas baboon during 2011/2012 and 2012/2013 on each counting sites are given in Tables 3 and 4. Similar results were obtained during consecutive counts on each counting sites and statistically no significant difference was found between consecutive counts.

During the 2011/2012 count, there was significant difference in the population size between adult males and adult females ($df = 1$, $t = 3.428$, $P < 0.05$). There was also a significant difference in the population size between adult males and adult females during 2012/2013 count ($df = 1$, $t = 3.548$, $P < 0.05$). Sex and age structure of hamadryas baboon based on seasons during 2011/2012 and 2012/2013 is given in Tables 5 and 6.

There was no significance difference in the abundance of individuals between wet and dry seasons ($df = 1$, $P = 0.3173$ at $P < 0.05$). There was also no significant difference in the number of hamadryas baboon between 2011/2012 and 2012/2013 ($df = 1$, $P < 0.3173$ at $P < 0.05$).

Table 1. Randomly selected respondents to collect data on human-hamadryas baboon conflict in the surrounding areas of Awash National Park.

Respondent	Respondents' category		
	Sex		Age
	Male	Female	
Scouts	8	-	31-40
Crop farmers	65	15	31-50
Pastoralists	90	30	31-50
Community leaders	10	-	> 50
ANP authorities	3	-	31-40
District administration	4	-	31-40
Students	7	3	15-20
Others (visitors)	1	1	20-30

Table 2. Interviewees on human-hamadryas baboon conflict in Awash National Park.

Interviewees	Interviewees category		
	Sex		Age
	Male	Female	
Awash Fentale district head	1	-	31-40
Awash district Administrative head	1	-	40-50
Awash district staff	3	2	31-40
Awash Fentale district staff	3	2	31-40
Community leaders	4	-	> 50
ANP warden	1	-	31-40
ANP staff	5	-	31-40

At the same time there was no significant difference in the rate of change of variation in number ($df = 1$, $P < 0.3173$, $P < 0.05$).

There was no significant difference in the number of hamadryas baboon during the wet season of 2011/2012 ($x^2 = 26.581$, $df = 1$, $P < 0.01$). There was also no significant difference in the number of hamadryas baboon during the dry season of 2012/2013 ($x^2 = 12.033$, $df = 1$, $P < 0.01$).

During 2011/2012, the individual count at Awash National Park was 15% adult male, 27% adult female, 11% sub-adult male, 14% sub-adult female, 10% juvenile male, 16% juvenile female and 3% infant. During 2012/2013 count, it was 19% adult male, 26% adult female, 9% sub-adult male, 14% sub-adult female, 11% juvenile male, 18% juvenile female and 3% infant.

Male-female ratio of hamadryas baboon during the year 2011/2012 and 2012/2013 based on seasons are given in Tables 7 and 8. The proportion of male-female hamadryas baboon during 2011/2012 and 2012/2013 is given in Tables 9 and 10.

Habitat suitability is defined based on forage and water availability which determine the ranging and travel patterns of the baboons in search of resources on daily basis. De-

pending on the availability of resources, suitable, moderately suitable and unsuitable habitats of hamadryas baboons are given in Figure 2.

Respondents for questionnaires and structured interview are given in Tables 11 and 12. The respondents were scouts from local and federal governments, students, farmers, pastoralists, community leaders, park authorities, district administrators both from Afar and Oromia Regions. For questionnaires, 237 respondents and 22 interviewees were randomly selected. Responses of respondents on human-hamadryas baboon are given in Table 11.

Most of the respondents responded that hamadryas baboons in ANP were killed by farmers and their response was significantly different ($X^2 = 173$, $df = 1$, $P < 0.01$). The majority of the respondents also responded that hamadryas baboons in ANP raid crops and their response was significantly different ($x^2 = 44.764$, $df = 1$, $P < 0.01$). Almost all the respondents commented that palm forest was deforested by the local people and their response was significantly different from those who responded against ($x^2 = 163.751$, $df = 1$, $P < 0.01$). The majority responded that there was deforestation of Acacia trees for charcoal production in ANP and their response was significantly different ($x^2 = 170.468$, $P < 0.01$). The majority responded that hamadryas baboons kill young goats and lamb, and their response was significantly different ($x^2 = 150.722$, $df = 1$, $P < 0.05$). Most of the respondents responded that there was settlement in the park and their response was significantly different ($x^2 = 157.169$, $df = 1$, $P < 0.01$). The majority responded that there was illegal settlement in the park and their response was significantly different ($x^2 = 53.878$, $df = 1$, $P < 0.01$). Structured interview responses on the relationship between park authorities and local community leaders for managing ANP are given in Table 12.

Majority of the interviewees responded that hamadryas baboons in ANP were threatened due to habitat loss and killing by farmers, and their response was significantly different ($x^2 = 14.727$, $df = 1$, $P < 0.01$). Most of the interviewees responded that awareness creation on the local people was lacking and their response was significantly different ($x^2 = 4.545$, $df = 1$, $P < 0.05$). Almost all the interviewees responded that ethnic disputes disturb hamadryas baboons in ANP and their response was significantly different ($x^2 = 11.636$, $df = 1$, $P < 0.01$). The majority of the interviewees responded that ANP authorities and local community leaders do not work together to safeguard the species in the park and their response was significantly different ($x^2 = 14.727$, $df = 1$, $P < 0.01$).

There was no significant difference between their response on the presence of deforestation and overgrazing in ANP ($x^2 = 0.182$, $df = 1$, $P > 0.05$).

DISCUSSION

The current study showed that hamadryas baboons in ANP have been using five sleeping cliffs. Besides,

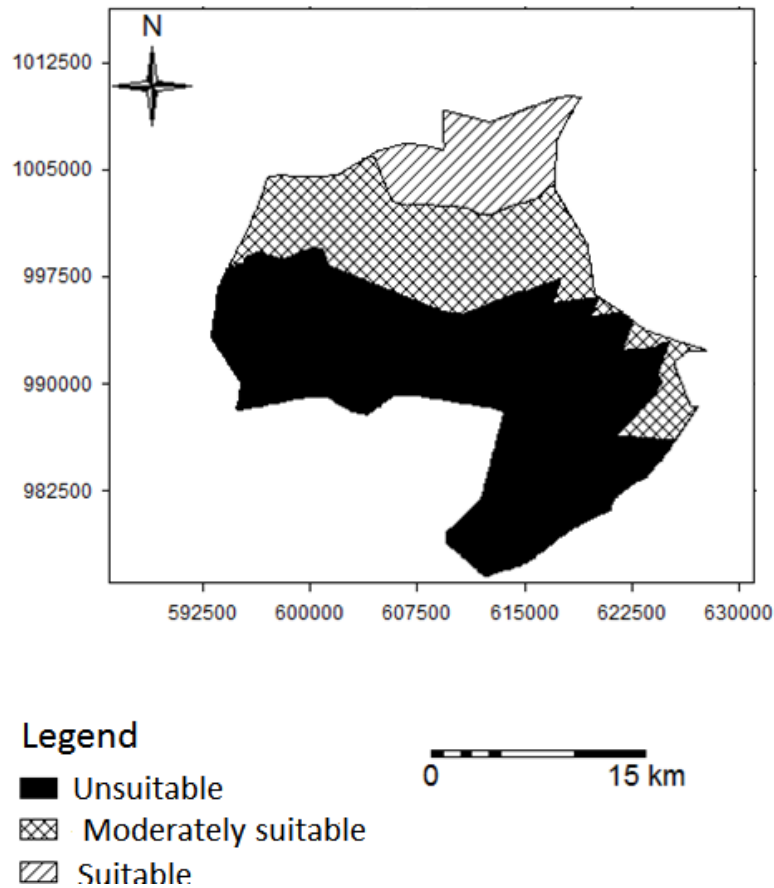


Figure 2. The distribution of hamadryas baboon based on habitat suitability.

Table 3. Population size, sex and age structure of hamadryas baboon during 2011/2012 in ANP (M = male, F = female, SUI = sex unidentified).

Counting site	Adult		Sub-adult		Juvenile		Infants	
	M	F	M	F	M	F	SUI	Total
Wasero cliff	105	175	94	145	80	119	22	740
Filwoha cliff	64	100	54	84	42	64	12	420
Urulie cliff	6	14	6	8	4	6	2	46
Dahilebora cliff	28	62	22	34	18	38	8	210
Fentale cliff	22	51	12	22	16	36	6	165
Total	225	402	188	293	160	263	50	1581

Table 4. Population size, sex and age structure of hamadryas baboon during 2012/2013 in ANP (M = male, F = female, SUI = sex unidentified).

Counting site	Adult		Sub-adult		Juvenile		Infant	
	M	F	M	F	M	F	SUI	Total
Wasero cliff	190	210	60	94	102	146	18	820
Filwoha cliff	60	98	36	48	24	38	12	316
Urulie cliff	12	18	10	14	8	11	5	78
Dahilebora cliff	64	116	38	70	44	88	11	431
Fentale cliff	24	56	22	34	18	38	8	200
Total	350	498	166	260	196	321	54	1845

Table 5. Size and age structure of hamadryas baboon based on seasons during 2011/2012 count (M = male, F = female, SUI = sex unidentified, S. adult = sub- adult).

Season	Adult		Sub-adult		Juvenile		Infant	
	M	F	M	F	M	F	SUI	Total
Wet	130	240	100	160	90	145	28	893
Dry	95	162	88	133	70	118	22	688
Total	225	402	188	293	160	263	50	1581

Table 6. Size and age structure of hamadryas baboon based on seasons during 2012/2013 count.

Season	Adult		Sub-adult		Juvenile		Infant	
	M	F	M	F	M	F	SUI	Total
Wet	190	264	87	140	105	180	31	997
Dry	160	234	79	120	91	141	23	848
Total	350	498	166	260	196	321	54	1845

Table 7. Male-female ratio of hamadryas baboon during 2011/2012 based on season (M = male, F = female).

Season	Adult	Sub-adult	Juvenile
	M:F	M:F	M:F
Wet	1: 1.85	1: 1.6	1: 1.61
Dry	1: 1.71	1: 1.51	1: 1.69
Total	1: 1.79	1: 1.56	1: 1.64

Table 10. Male-female ratio of hamadryas baboon on each counting sites during 2012/2013.

Season	Adult	Sub-adult	Juvenile
	M:F	M:F	M:F
Wet	1: 1.39	1: 1.69	1: 1.71
Dry	1: 1.46	1: 1.52	1: 1.55
Total	1: 1.42	1: 1.57	1: 1.64

Table 8. Male-female ratio of hamadryas baboon during 2012/2013 based on season

Counting site	Adult	Sub-adult	Juvenile
	M:F	M:F	M:F
Wasero cliff	1: 1.7	1: 1.5	1: 1.5
Filwoha cliff	1: 1.6	1: 1.6	1: 1.5
Urulie cliff	1: 1.2	1: 1.3	1: 1.5
Dahilebora cliff	1: 2.2	1: 1.5	1: 1.2
Fentale cliff	1: 2.1	1: 1.5	1: 2.1
Total	1: 1.8	1: 1.6	1: 1.6

Table 9. Male-female ratio of hamadryas baboon on each counting sites during 2011/2012.

Counting sites	Adult	Sub-adult	Juvenile
	M:F	M:F	M:F
Wasero cliff	1: 1.1	1: 1.6	1: 1.4
Filwoha cliff	1: 1.63	1: 1.3	1: 1.6
Urulie cliff	1: 1.5	1: 1.4	1: 1.4
Dahilebora cliff	1: 1.8	1: 1.8	1: 1.2
Fentale cliff	1: 2.3	1: 1.5	1:2.1
Total	1: 1.4	1: 1.6	1: 1.6

sometimes the baboons may use palm trees as a sleeping site. Similarly, Schreier and Swedell (2008) reported that hamadryas baboons living around Filoha at ANP use *Hyphaene thebiaca* trees as sleeping sites. It is not common to observe hamadryas baboons and other species of baboons using trees as a sleeping site. According to Schreier and Swedell (2008), baboons sometimes sleep on trees because Wasero and Filoha cliffs have been highly disturbed by nomadic pastoralists. Baboons do not permanently use trees as a sleeping site especially during the wet season, so the palm tree areas were not used as a counting site for hamadryas baboons. In the year 2011/2012, the number of hamadryas baboon in ANP was counted. In 2012/2013 the number of hamadryas baboon was similarly estimated. In the estimates of 2011/2012 and 2012/2013, the number of female hamadryas baboon was higher than the males. In both estimates, the largest individuals of hamadryas baboon sleep on Wasero and Filoha sleeping cliffs and a few individuals in Urulie cliff both during wet and dry seasons across the study period. In ANP, the female individual number of hamadryas baboons was larger than the males. However, in terms of social organization, the male is highly dominant. Similarly, Zinner et al. (2006) reported that dominant male leader prevents females from interacting with other males and females and keep them for him-

Table 11. Responses of respondents' on human-hamadryas conflict in Awash National Park.

Reason	Respondents' response			
	Strongly		Strongly	
	Agree	Disagree	Agree	Disagree
Hamadryas baboon raid crops	130	90	8	9
People settle in the Park	145	30	43	19
Local people kill hamadryas baboon	100	80	27	30
There is overgrazing in ANP	198	10	10	10
Local people kill hamadryas baboon to exercise shooting targets	80	90	60	7
Crop raiding is controlled by shooting	133	45	40	19
Hamadryas baboon is a threat for farmers and pastoralists	143	30	40	24
Caracas of hamadryas baboon was observed around agricultural areas	30	38	100	69
Palm forest in ANP is deforested by local people	200	17	10	10
<i>Acacia</i> trees are deforested for charcoal	188	31	9	9
ANP and hamadryas baboon are not important	18	40	178	1
Gunmen are common in ANP	200	30	3	4
It is right to get into the park and cut trees for fire fuel and other reasons	194	24	10	9
Hamadryas baboon are not important for economic benefits of local people	200	20	9	2
Hamadryas baboon killed lamb and goats	196	17	18	6
Only central government must conserve hamadryas baboon in ANP	143	58	27	9
Community leaders and ANP leaders must conserve the baboons	61	27	122	27
Everybody is responsible for conservation	30	40	145	22
Training was given to local people	10	12	173	42
Hunting is common in ANP	130	64	33	10

Table 12. Interviewees' responses on conflict between the local people and hamadryas baboon in ANP.

Question	Number of interviewees			
	Strongly		Strongly	
	Agree	Disagree	Agree	Disagree
Hamadryas baboon is threatened	14	6	1	1
Community leaders and ANP authorities work together on conservation	1	1	16	4
Awareness is lacking about economic benefits of wildlife by local people	14	2	4	2
Deforestation and overgrazing are common in ANP	8	2	8	6
Scouts and drivers are killed by pastoralists	18	1	2	1
Ethnic disputes disturb hamadryas baboon in ANP	19	1	1	1
Training was not given to the local people about hamadryas baboon importance	2	3	15	3
ANP may not continue as a park	16	1	4	1
Hunting, Overgrazing and charcoal production may affect the number of hamadryas baboon	19	1	1	1
ANP authorities and community leaders work together to safeguard the hamadryas baboon	1	1	18	2

self. In hamadryas baboons, high ranking dominant leader males had access to females. Where there are large numbers of females, the prospect of size would be good, unless resources become scarce and human interferences affect the population trend. Abundance has no significant difference between wet and dry seasons. The ratio of adult male-female, sub-adult male-female, and juvenile male-female showed the number of female individuals were higher than male individuals. The increase in number of females can be good because in social orga-

nization of hamadryas baboons, the dominant males can form one male unit, by having more than two females, their young and sub-adult males. The current study also showed that the density of hamadryas baboons was also estimated during both seasons.

The current study showed that hamadryas baboons were distributed largely along the northern part of ANP. The reason may be due to the availability of sufficient resources like forage, water holes, sleeping cliffs and trees that are also used as sleeping sites. Kummer (1968a) re-

ported that hamadryas baboons live in semi-desert and savanna habitats but their distribution in semi-deserts is affected when resource availability decreases and hence, move to live in higher altitudes about 3000 m. This shows that the distribution of hamadryas baboon is limited by the availability of food and water resources in their habitat. Although, hamadryas baboons were largely distributed in the northern part of ANP, it was confirmed that hamadryas baboons also travel towards the south in search of resources during drought. The concentration of individuals along the northern part was due to the presence of major food plants. However, some of the plant species consumed by hamadryas baboons were also found in the south central and southern part of the park. *Balanites aegyptiaca* and *Dobera glabra* were abundantly found in the northern as well as in the southern part of ANP. Usually, the baboons move to the south central and far southern part of the park during the dry season. Therefore, the northern part of the park is a highly suitable habitat to the baboons. Habitat conditions such as forage, water holes, sleeping cliffs and trees can limit the distribution of hamadryas baboons in ANP. Similarly, Shefferly (2004) reported that the distribution of hamadryas baboons is highly influenced by the distribution and availability of resources, specifically food, water and sleeping cliffs. Besides, hamadryas baboons require water holes and forage not far from their sleeping cliffs to minimize the distance travelled in obtaining water as well as forage resources.

The current study confirmed that there is conflict between the local people and hamadryas baboon in ANP. 93% responded that there has been conflict between the local people and hamadryas baboon. Chapman and Peres (2001) reported that when baboons and humans live together around protected areas, conflict is inevitable because the natural habitats of baboons have been taken and disturbed by people. 89.9% responded that hamadryas baboons kill lamb and young goats which can increase the level of conflict between the local people and hamadryas baboons. The local farmers and nomadic pastoralists kill hamadryas baboons to revenge their raided crop and killed lambs and goats. Strum (2010) reported that recently baboons are highly threatened due to anthropogenic impacts on the habitat of baboons.

Similarly, Mesele et al. (2011) reported that large mammals cause crop raiding if agricultural fields are proximal to wildlife habitats. This may be due to competition between wildlife species and people living near protected areas. Similarly, Hockings et al. (2009) reported that when agricultural plantations, orchards, sugarcane plantations and other larger irrigation projects border the habitats of baboons, it will result in direct contact and competition between people and baboons. In the surrounding areas of ANP, there are agricultural activities such as orchards, sugarcane plantations, small scale farming and large number of nomadic pastoralists. Since, these agricultural activities are near ANP, hamadryas baboons cause con-

flict both with farmers and nomadic pastoralists by crop raiding and killing of lamb and young goats.

According to the current study, competition between livestock and wildlife in ANP such as grazers and browsers has been serious and hence, needs an immediate solution to minimize the level of competition. Unless immediate solution is taken, it will go beyond the control of the Park authorities and result in localized species extinction. In the current study, 73.8% of the respondents confirmed that the local people settled in the park, disturbed and intimidated wildlife species living in the park. Similarly, Pimbert and Pretty (1995) reported that local people who settle in the protected areas cause great damage to wildlife species and forests. Hence, the conflict between hamadryas baboon and the local people in the surrounding areas of ANP demands an immediate conservation management solution. The current study showed that the local people have deforested the palm forest which is very vital to the local people themselves and to the hamadryas baboons. Doum palm fruit is one of the major food sources for hamadryas baboons in ANP, particularly at Filwoha area, especially during the dry season when other resources become scarce. In ANP, deforestation is the major threat to wildlife species, especially to hamadryas baboons because the diet includes *Acacia* tree species that are being deforested for charcoal production.

Acacia forest in ANP is being deforested for charcoal production on a regular business by the local people who did not have awareness about the ecological importance of *Acacia* trees. The majority of the local people deforest *Acacia* trees for charcoal production. Similarly, Abbiw (1990) reported that when forests are deforested for any human interest, wildlife species in the forest will be homeless and threatened. Baboons of ANP are facing similar problems.

In the current study, it was confirmed that hamadryas baboon is considered as a crop raider by most local people in the surrounding areas of ANP affecting their agricultural fields. The major reason for the conflict between the local people and hamadryas baboon is that, the original habitats of the baboon was taken by people for sugar industry project and small scale farming in the area. Similarly, IUCN (1996) reported that in Ethiopia, hamadryas baboons live proximal to agricultural areas, raid crops and hence, considered as crop pests. According to the current study, enough training was not given to the local people in the surrounding areas of ANP about economic and ecological benefits of wildlife and plant species in ANP. Hence, the ANP authorities and non-governmental organizations should take part in giving training to create awareness about wildlife and plant species to safeguard these species from becoming extinct.

The majority of the respondents confirmed that scouts and drivers of ANP have been killed by nomadic pastoralists, while trying to secure law and order in the park. Hence, the nomadic pastoralists are beyond the control

of the ANP management and need the interference of the head quarter as well as the Regional and Federal Governments to minimize the impact of the nomadic pastoralists on ANP. In addition to disputes between Afar and Oromo ethnic groups, overgrazing, illegal settlement in the park, hunting, deforestation for charcoal production, killing hamadryas baboon to exercise target shooting, ignorance of the local people about the economic and ecological benefits of wildlife species particularly hamadryas baboon, lack of coordination between the local community leaders and ANP management are the major threats. Unless an immediate conservation management action is taken most species in ANP will disappear. If the current trend of ANP management continues the, park may not be able to sustain and continue as a protected area.

Conclusion

This study revealed that hamadryas baboons that dwell in the Awash National Park are threatened due to human created problems. Human-hamadryas baboon conflict has been aggravated because of crop raiding and killing of lamb and goats by hamadryas baboons in the surrounding areas. Besides, agricultural activities have been carried out near the park and the original habitats of the baboon were taken by people for sugarcane plantation, orchards and for small scale farming. This is confirmed by interviews and direct observation while the baboons raid crops. The count of individuals in ANP showed that number was almost constant during the two years of population study. However, if the current condition continues, the number of hamadryas baboon would be at risk and even become locally extinct. Therefore, conservation measure should be in place to safeguard the threatened hamadryas baboon in ANP. The park management should be able to plan new strategies for conservation and safeguard the species of wildlife including hamadryas baboon in the park.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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