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DIURNAL ACTIVITY PATTERNS OF WALIA IBEX (*CAPRA IBEX WALIE*) IN SIMIEN MOUNTAINS NATIONAL PARK, ETHIOPIA

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ABSTRACT: Diurnal activity patterns of Walia Ibex (*Capra ibex walie*) were carried out in Simien Mountains National Park between September 2004 and February 2005 by selecting two sites (Site-I and II). Focal sampling technique and direct observations were used to collect the data. Peaks in daily activity occurred near sunrise and sunset in both sites. The proportions of time budget varied between the sites. Feeding accounted for more than 51.3% and 44.1% in site-I and II, respectively. Despite the variation in percentage, two-sample t-test comparison of the mean for the two areas showed no significant difference (p=0.306) and the active hours of the two sites correlated (r=0.818). At 0.05 level, the two-sample t-test indicated lying (p=0.023), walking (p=0.001) and vigilance (p=0.001) showed significant difference in the diurnal time budget spent. These results indicate the degree of Walia Ibex fearfulness towards people.

Key words/phrases: Activity pattern, *Capra ibex walie*, Simien Mountains National Park.

INTRODUCTION

Ibexes are virtually followers of glaciers and are adapted to bare mountains. They used to occur in groups numbering dozens of animals. Nevertheless, they are now rare and considered to be threatened. There are a number of subspecies that today occur in all higher mountainous areas of the Palaearctic region. It is assumed that the *Capra ibex walie* immigrated 14,000 to 26,000 years ago from the near east (Nievergelt, 1981).

Capra species typically show a diurnal activity pattern of two distinct peaks of feeding, one in the morning and one in the evening, separated by a resting period (Dunbar, 1978; Hess, 2002). Nicholson and Husband (1992) observed this pattern for Cretan wild goat (*Capra aegegrus*) and Fox *et al*. (1992) confirmed it for Asiatic ibex (*Capra ibex sibirica)* as well. Geist (1970) explained human disturbances can cause severe alterations to the behaviour of a species with influence on the physiology, population dynamics, and ecology of the animals. Heavy use of the wildlife habitats by the public can disturb wildlife, causing some species to leave the area, and even causing mortality of some species if the disturbance occurred during a

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stressful period.

Behavioural response to the human presence has often been used as an index of an animal's susceptibility to disturbance. Gill *et al.* (2001) described how the priorities that animals assign to different activities can affect the behavioural response they show to disturbance. The effective management of animal populations depends on thorough knowledge of each species' interaction with its environment. One of the most useful methods for describing this relationship is to quantify the activity patterns in different habitats which the animal is utilizing (Somers, 1997).

The *Capra ibex walie* of this study are found in Simien Mountains National Park (SMNP), in the northern Ethiopia highland massif some 900 km from Addis Ababa. The Park was established in 1969 to preserve the high altitude biota particularly the *Capra ibex walie* as well as some of the spectacular gorges and escarpments in the region. The animal is one of the most endangered mammals of the world. In 1978, UNESCO designated the Park a World Heritage Site. The Park was also placed on the List of World Heritage in Danger in 1996 after following a UNESCO monitoring mission that reported declines in both Ethiopian wolf and walia ibex populations, and continued human pressure on the park.

MATERIALS AND METHODS

Daily time budget of *Capra ibex walie* were recorded between September 2004 and February 2005 on intentionally-chosen two sites (Site-I and-II) (Fig. 1). Focal sampling technique of Altman (1974); Somers (1997) and direct observation methods of Dinerstine (1979); Ono *et al*. (1988); Ruckstuhl (1998); Abegg and Richard (1991) were used to collect the data. Ibexes were observed with the aid of 8X50 power binoculars and 15-60X spotting scopes. The observations were made at a relatively long distance averaging 600 m range (400-1000 m).

The behaviour of each animal was noted every 5 minutes and classified in one of six behavioural activity categories: feeding, standing, lying, walking, vigilance and "other". This is a slight modification of the method of 4 minutes recording interval used by Spinage (1968) and Jarman and Jarman (1973) when studying the activity pattern of Waterbuck (*Kobus dafessa ugandae*) and Impala (*Aepycerus melampus*). "Walking" was recorded only if the Walia Ibex was walking at a steady pace, and not if it was merely moving from one feeding position to the next following the criterion developed by Wyatt and Eltringham (1974). Other activities include social interactions, suckling, grooming, fighting, and running. In order to compare

time budget records between the two study sites, site-I was defined as relatively undisturbed and site-II as disturbed habitat. Recording began at 0600 h in the morning and continued until 1800 h.

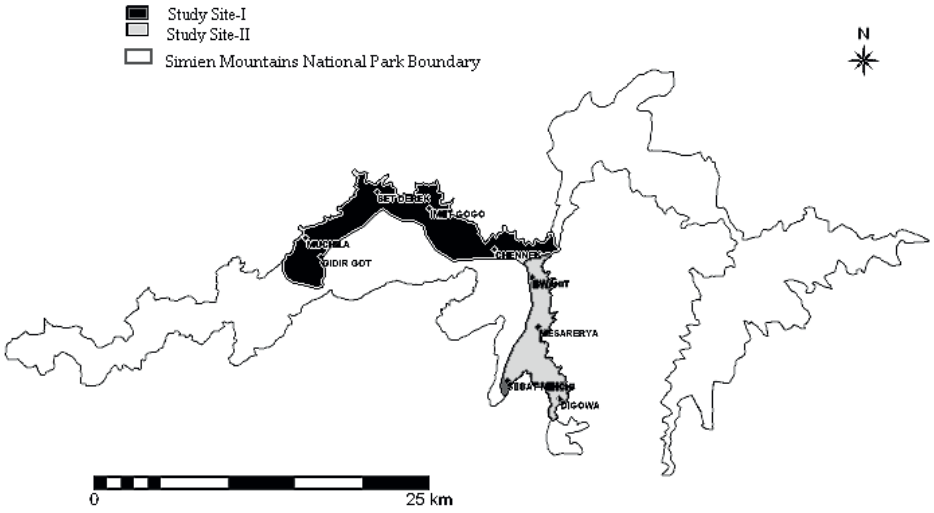

Fig. 1. Map of Simien Mountains National park showing study sites-I and-II.

Two intensive total counts of the Walia ibex population were made across the entire study area following the method described by Wilson *et al*. (1996). Observations in 39 counting blocks were conducted simultaneously, between 0630 and 1100 h when the animals were active, in November 2004 and February 2005.

Study area

The SMNP is part of the Simien Mountains massif that lies at elevations between 2000 and 4543 m asl taking in Ras Dejen, the highest peak of the country. It is located in the Simien Mountains between 38^0 12` E and $13^0$ 19` N in the North and north western part of Ethiopia (Fig. 2). The legally gazetted area of the National Park was only 136 km^2, and 276 km^2 area was included in the expansion work done recently which raised the total area to 412 km^2.

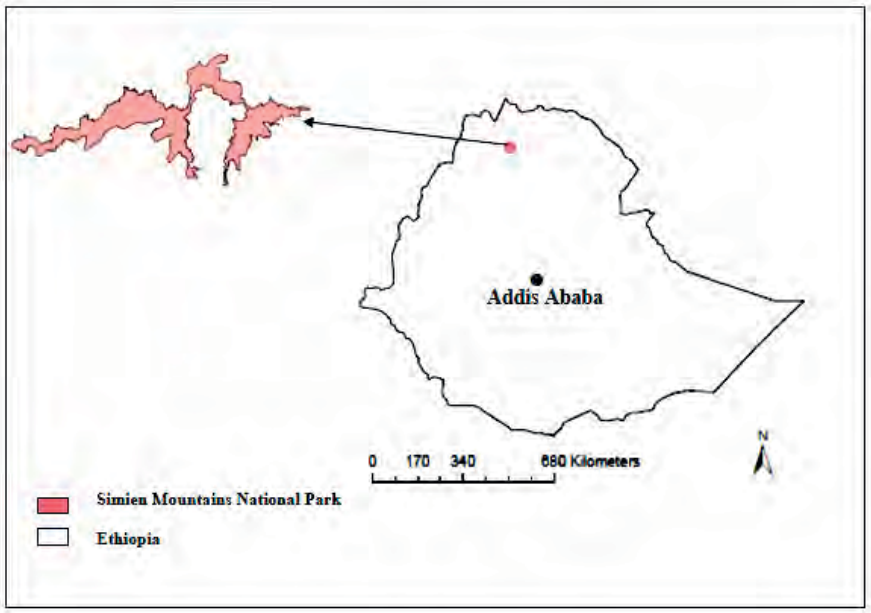

Fig. 2. Map showing Simien Mountains National Park.

The study site-I (ranging from Muchila–Set Derek–Imet Gogo–Chennek) covers an area within the traditional National Park. It is still forested in many parts, heterogeneous in terrain, many almost inaccessible with sufficient fresh food and with few (for the animals) unpredictable dangers, respective disturbances by man with livestock as well as poaching (mainly in earlier years). The site is a habitat where a predator such as the leopard has a chance to approach successfully along a hidden path.

The study site-II along the Bwahit–Mesarerya–Sebatminch–Digowa range is a more open area with limited food, and with many people passing this area along roads, but the disturbance is of a predictable and harmless character to the animals. Due to the open character of these habitats, that are even crossed by a highly frequented market-route, it is very likely, that this area where human influence is predictable, with open and overlookable terrain, protects the Ibexes from poachers as well as predators. But living as an ibex in that area of study site II is connected with frequent walking due to poorer vegetation and feeding on the unsafe plateau where peoples' movements are less predictable.

RESULTS AND DISCUSSION

Table 1 shows the time budget of Walia Ibex recorded in each hour of the

day during a sample of 24 days over 6 months of the study period. A total of 8640 observations were taken between 0600 to 1800 h. The animals under observation were followed for the whole day for two days every month in each study site. On each day of observation, an approximately equal time was spent in each hour of the daylight.

Table 1. Diurnal time budget (%) of Walia Ibex (* Study site-I, ** Study site-II).

Time	Feeding		Standing		Lying		Walking		Vigilance		Other activities	
	SI*	SII**	SI	SII	SI	SII	SI	SII	SI	SII	SI	SII
0600-0700	54	61	5	4	11	5	6	7	10	11	14	12
0700-0800	53	60	4	3	11	5	6	7	11	12	15	13
0800-0900	56	63	3	5	13	2	7	9	12	14	9	7
0900-1000	57	46	0	8	14	5	12	17	13	16	4	8
1000-1100	45	36	2	4	19	15	10	13	12	14	12	18
1100-1200	33	22	10	9	23	14	10	19	6	16	18	20
1200-1300	29	18	16	12	24	14	4	16	8	15	19	25
1300-1400	29	18	17	11	27	18	4	16	6	16	17	21
1400-1500	41	39	21	17	18	5	10	21	9	12	1	6
1500-1600	73	46	7	14	9	8	5	14	3	11	3	7
1600-1700	74	59	2	5	4	5	8	13	7	9	5	9
1700-1800	72	61	1	5	5	5	4	8	7	9	11	12
Mean (%)	51.3	44.1	7.3	8.1	14.8	8.4	7.2	13.3	8.7	12.9	10.7	13.2

Compared to study site-I, study site-II offers good accessibility to local people and is heavily traversed by people, livestock and vehicles. The study site-I is traversed by relatively low number of people who cross only the track to go down and come up the mountains. In order to observe changes in time budget of Walia Ibex in response to human pressure, populations residing in the two different areas that differ in the amount and types of human usage of the areas, including their livestock, were selected. A time budget analysis builds up a useful picture of an animal's life and can answer many questions about how it behaves (Pe'rez *et al.,* 2002).

Fig. 3 provides average hourly time budget of Walia Ibex. Though there are some significant variations in some categories of the activity of Walia Ibex

between the two sites, the result generally shows that they are markedly most active between hours of 0600 and 1100; activity then drops during the period 1200 to 1600 and rises again after 1700 h and drops again after 1800 h. These times are well within the range of diurnal times for grazing ruminants in Africa (Hunting Technical Services Ltd., 1976). The majority of recorded time budget in both sites consisted of feeding, 51.3% in site-I and 44.1% in site-II (Fig. 4).

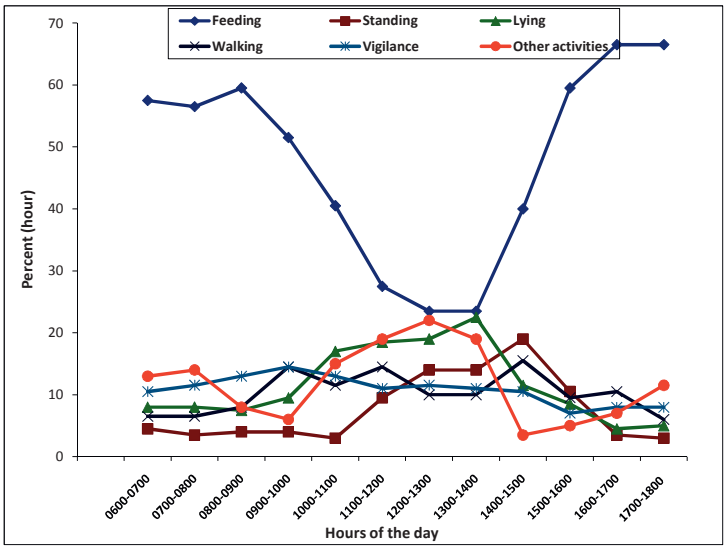

Fig. 3. Diurnal time budget.

Two-sample t-test was applied to test the mean time budget differences in various activity categories in the two sites and the results indicate p values for feeding (p=0.306), standing (p=0.760), lying (p=0.023), walking (p=0.001), vigilance (p=0.001) and other activities (p=0.341). At the 0.05 level, lying (p=0.023), walking (p=0.001) and vigilance (p=0.001) did show significant difference while there was no significant difference in the rest of the diurnal time budget expenditure.

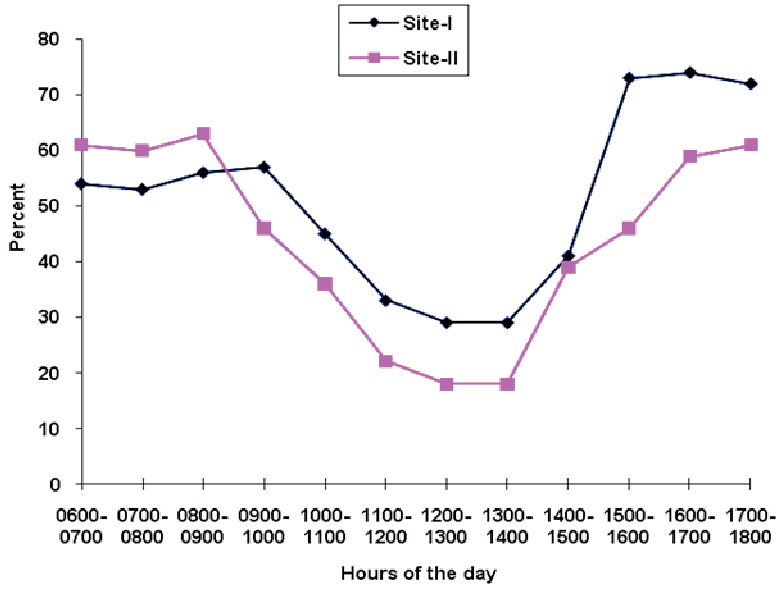

Fig. 4. Comparison of mean percentage of hourly feeding time budget of Walia Ibex in site-I and II.

The proportion of time spent on feeding in the morning was more in site-I and less in site-II. However, they commenced feeding earlier than the walias in site-I and retreated earlier. This could be due to the peak of human activities particularly a large number of livestock with the herds traverse the Walia habitat after the day grazing every evening. Despite these variations the active hours for site-I and II correlated and were similar and it was significant at 0.05 level (r=0.818). Goats typically have peaks of activity in the early morning and in the evening (Sunders, 1955).

The rank of time devoted for the remaining activities varied between sites. Lying came second in site-I (14.8%) and it was walking (13.3%) or vigilance (12.9%) that was very important in site-II, next to feeding. On the other hand, the percentage of time devoted for walking (7.2%) and vigilance (8.7%) in site-I was less important and lower than site-II, despite the occurrence of predators in this area (Table 1).

Lying time was less reduced and walking and vigilance were greater in site-II than site-I because of human disturbance in the habitat of the animal that traversed 24 hours. However, the amount of time spent lying in the shade or

in the open areas increased from the early morning (0900) towards midday and early afternoon (1400) hours in site-I. More time was spent lying between 1000 to 1300 hours. During such a lying period, they would just mainly ruminate and periodically groom themselves using their horn. They usually lied up in caves or thickets during the day. Caves with a clear view of the surroundings were normally used as a bedding site.

Even though walking was more frequent in site-II, the animals walked in both study sites for the whole day for shorter distances and recommenced feeding after a few minutes, usually 2-4 minutes. Walking is predominantly a function of getting from one feeding site to the next and it is mainly for avoidance of humans in a disturbed area. Most commonly in site-II, individuals in a herd looked in all directions and time spent in vigilance was higher throughout the day which indicated more disturbance in this habitat than site-I. When they saw and/or heard man and/or other intruders, they watched continuously, left the feeding habitat, and moved towards the inaccessible areas.

It was found that vigilance and walking were essential behaviour of Walia ibex in the study site-II. More than 12% of the total time budget was invested in these activities where the human pressure was high. Lying in this site was also highly influenced and the percentage time devoted for this activity was very small (8.4 %) compared to site-I (14.8 %). Other activities recorded include grooming, sexual behaviour, suckling of young, defecating, urinating, etc. These activities were observed predominantly when the animals were at rest and/or standing.

The two direct counts of the animals resulted in a total of 579 and 567 individuals in each site. These gave an average of 573 individuals in the entire range of the animals.

CONCLUSION

In Walia ibex, like in other ungulates, the daily routine is not uniformly distributed over the time of the day. The animals interrupt their feeding activity around the middle of the day. They spent less time feeding and more time for vigilance and, walking in site-II than site-I. The variations in the time budget might be caused due to human activity disturbance in the area. Therefore, it would be expected that such behavioural response to human disturbance is high and affects its normal behaviour and time budget in site-II than site-I. Study site-I requires more attention perhaps due to less human and livestock disturbances, but richer vegetation which seems suitable for the survival of the animals in the future.

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