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CURRENT POPULATION STATUS OF THE ENDANGERED ENDEMIC SUBSPECIES OF SWAYNE'S HARTEBEEST (*ALCELAPHUS BUSELAPHUS SWAYNEI*) IN MAZE NATIONAL PARK, ETHIOPIA

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ABSTRACT: A study on current population status, sex ratio and age structures of Swayne's hartebeest (*Alcelaphus buselaphus swaynei*) was carried out during 2009/2010 in Maze National Park. Total count method was used in an area of 220 km^2 using well trained park scouts based on silent detection. There were 372 individuals counted. The population trend indicates that there is a significant increase in the number of Swayne's hartebeest population in Maze National Park at present. The sex ratio of adult males to adult females and young to adult females was 1:1.4 and 1:2.2, respectively. There is no significant difference between the sex ratio of males and females whereas there is a significant difference between young and adult females. Group size of Swayne's hartebeest varied from solitary individuals to a maximum of 27. The difference among the groups is not significant. More solitary adult males were observed than solitary adult females. Swayne hartebeests were more associated with grassland with scattered trees (54%) than other three habitat types of the area, savannah grassland, bushland and riverine forest. There were no significant differences among the association of habitat types. Hartebeests were more associated to oribi (68%) than other ungulate species. There is an urgent need for further study to evaluate the actual threat of the endangered endemic subspecies of Swayne's hartebeests in Maze National Park.

Key words/phrases: Endangered, Maze National Park, population status and structure, sex ratio, Swayne's hartebeest

INTRODUCTION

Africa's tropical savannas support the world's most spectacular mammal fauna with large herds of antelopes. The high degree of endemism is one of the reasons that made the African fauna so interesting and spectacular (East, 1999). East Africa is noted for its diversity and abundance of large mammalian herbivores. The Horn of Africa shows a great diversity of landscape and environment (Kutilek, 1979). The wide range of habitats in Ethiopia, from arid desert, open grassy steppe, and semi-arid savannas to highland forests and Afro-alpine moor lands, support an exceptionally diverse antelope fauna (Hillman, 1993). Ethiopia is one of the few countries in the world that possesses a unique and characteristic biota with high level of endemism (Jacobs and Schloeder, 2001). However, due to man-made and natural degradation processes, this wildlife has largely been restricted to within a few conservation areas of the country (Hillman, 1993).

Hartebeests (*Alcelaphus buselaphus*) are large African antelopes of the open grasslands. They were first named by Pallas in 1766. The very elongated faces are exaggerated by the bony extension or pedicle from which their horns grow (Flagstad *et al*., 1999). *Alcelaphus buselaphus* was a widespread and variable species, ranging from Senegal eastwards to Ethiopia and south to South Africa. At present, hartebeests are found only in parts of Botswana, Namibia, Ethiopia, Tanzania and Kenya (Batty, 2002).

Eight distinct *Alcelaphus* subspecies are recognized in Africa (Fig. 1). They are large sized antelopes in which males weigh between 120 and 228 kg and females on average 5–12% less than males (Flagstad *et al*., 1999). The colouration of hartebeest varies dramatically between subspecies, from light tan through bright rufous to deep maroon. In addition, there may be blackish markings on the head and legs (Kingdon, 1997). Hartebeests inhabit the savannahs and grasslands of Africa and may occur in woodland or scrub areas more than other *Alcelaphines*. Hartebeests are exceptionally tolerant to poor-quality food (Batty, 2002).

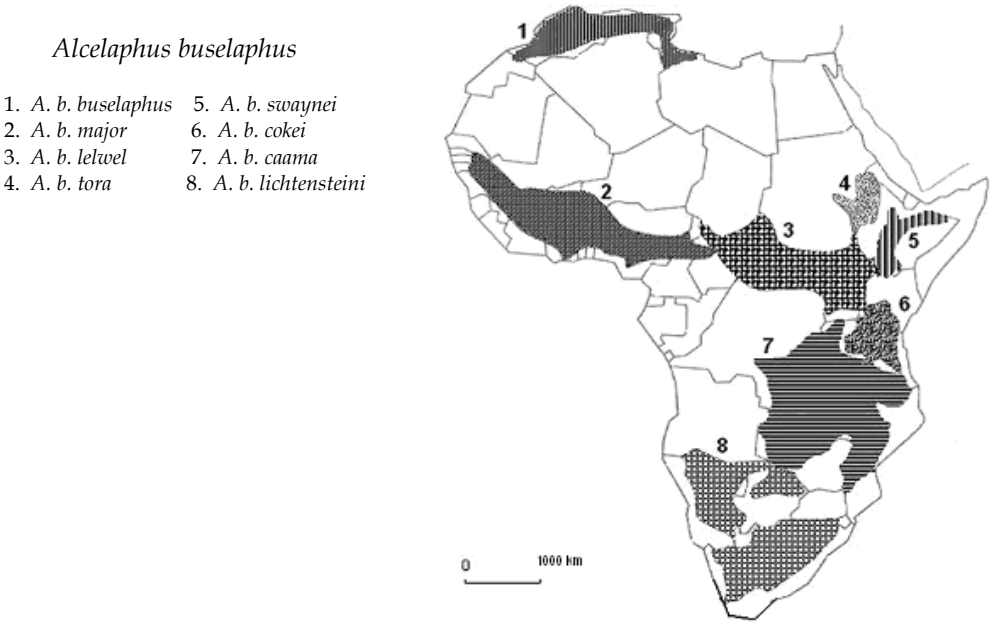

Fig. 1. Distribution of different subspecies of hartebeests (*Alcelaphus buselaphus*) in Africa (Capellini and Gosling, 2007).

Within a herd, there are territorial adult males, non-territorial adult males, groups of young males, and groups of females and young. There are strong dominance relationships between females seldom fighting one another (Kingdon, 1989). Females and young may move in and out of the territories freely, looking for a better grazing area. Males lose their territory after 7 to 8 years (Kingdon, 1989; Batty, 2002). Both sexes fight vigorously in defence of their offspring or territories. Hartebeests are social animals living in organized herds of up to 300 in a herd (Batty, 2002). They are very alert and cautious compared to other plains ungulates. Hartebeests rely primarily on sight to spot predators, and snort to warn each other from approaching danger. They move fast, may reach speed of 70 to 80 km/h one behind the other, after they see one of the members of the herd rushing away. Reproduction varies seasonally, but is perennial with 1 or 2 extended peaks depending on the population or subspecies of hartebeests involved (Kingdon, 1989; Batty, 2002).

In Ethiopia, three sub-species occur: *A. b. lelwel, A. b. tora* and *A. b. swaynei* (Flagstad *et al*., 2000). Swayne's hartebeest (*Alcelaphus buselaphus swaynei*), locally known in Amharic as 'Korkay', is the most attractive and colourful of the three subspecies (Tischler, 1975). They are distinguished from other hartebeests by the presence of darker body colour. It has a deep red chocolate brown or bright reddish brown with a fawn or yellowish brown-collared rump colour along the tail and lower half of legs (Bolton, 1973; Tischler, 1975). The horns, which are present in both sexes, are particularly widely spread. Horn shape and growth vary with age, but at maturity, the horns generally diverge widely from the pedicle and the points are usually turned back. Befekadu Refera and Afework Bekele (2006) described Swayne's hartebeest of Maze National Park with several marked differences from that of Senkele Swayne's Hartebeest Sanctuary. Most of the animals have a light fawn band running along the top of their back from the rump to the base of the head. Dark rib and hind leg patches do not occur in any of the animals. There is also regional difference in horn shape, flattened in Senkele while circular in Maze, especially where the horns emerge from the pedicle.

Swayne's hartebeests were widely distributed in Ethiopia and northern Somalia until the beginning of the nineteenth century (Swayne, 1899). At present, the population size has decreased and occurs only in four localities of Ethiopia: Nechisar and Maze National Parks, Senkele Swayne's Hartebeests Sanctuary and a smaller number observed in the vicinity of Yavello (Messana and Bereket Netsereab, 1994; Befekadu Refera and Afework Bekele, 2006). Among the hartebeests, *A. b. swaynei* and *A. b. tora* are classified as endangered and critically endangered, respectively (Flagstad *et al*., 2000; Pascal *et al*., 2008). The overall objective of this

study is to assess the current population status and sex ratio and age class structures of Swayne's hartebeests (*Alcelaphus buselaphus swaynei*) in Maze National Park (MNP), Southern Nations Nationalities and People's Regional State (SNNPRS), Ethiopia.

MATERIALS AND METHODS

The study area

The study was carried out in Maze National Park (MNP), which is located in Southern Nations Nationalities and Peoples Regional State, Ethiopia. The name of the Park is derived after the largest river called Maze River, which rises from the southern parts of the surrounding highlands and passes through the Park in the north direction, and finally drains to Omo River. The Park was established by the regional state in 2005. It is about 485 km southwest of the capital Addis Ababa via Wolaita Sodo-Sawla road. It is situated between 06°03' and 06°30' N latitude and 37°07' and 37°20' E longitude. The Park is surrounded by chains of mountains and bounded to the north by Quecha Wereda, to the northwest by Omo River and Gofa Wereda, to the west by Zalla Wereda, to the east by Deramalo Wereda and to the south by Kemba Wereda. The altitude ranges from 998 to 1200 m above sea level and covers an area of 220 km^2 (Fig. 2).

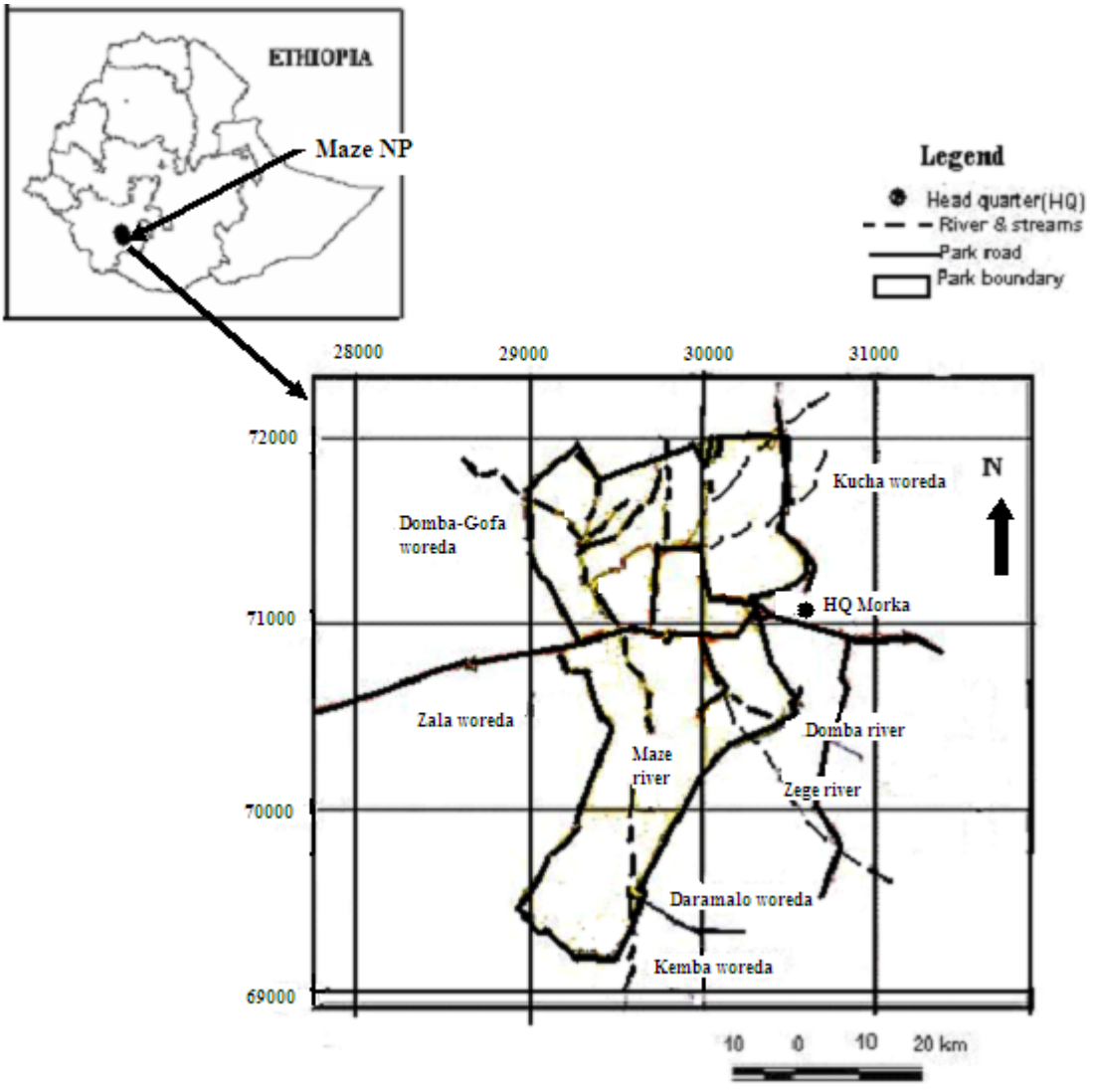

Fig. 2. Map of Maze National Park (Source: Maze National Park Office).

Rainfall at Maze (Morka area), although continuous has a moderately bimodal pattern, typical of semi-arid agro-ecological zone of Ethiopia. The annual rainfall varies between 843 and 1321 mm. Maze area experiences a long rainy season that extends from April to October with the highest peak towards the end. The dry season is from November to February (NMSA 2001–2002 Meteorological data). The lowest temperature recorded during the wet season was 15.3°C in June and the highest during the dry season 33.5°C in February. The soil types on the escarpments of the study area are of volcanic or metamorphic origin. Matewos Ersado (2003) and Siraj Mohammed (2008) stated that most of the plain area of Maze National Park is covered by open *Combretum-Terminalia* wooded grasslands. An occasional variant of woodland vegetation is usually associated with riverine habitats. *Combretum* dominated wooded grasslands occupy well-drained sites on the upland. This includes the higher ridges and side slopes. It is fire-induced type that replaced a true *Combretum* woodland or evergreen bushland/scrub forest.

There are 146 plant species (Siraj Mohammed, 2008) and 39 mammalian species recorded (Dawud Yimer, 2008). Land-use practices in the Park are agriculture, pasture and harvesting of natural resources such as, firewood collection, charcoal production, honey collection and harvesting building materials. The local people take their livestock for grazing and drinking water to the rangelands in and out of the Park area. The Park area provides breathtaking scenery with immense potential for tourist attraction.

Population estimate and structure

A total count method was applied throughout the study period to estimate the population size of Swayne's hartebeest based on silent detection as adopted by Sutherland (1996) and Wilson *et al*., (1996). Counting was carried out using unaided eyes and/or a pair of binoculars, while on foot and/or on car during the study period. Census was conducted when the Swayne's hartebeests were most active and with good visibility during 0800 to 1100 hours in the morning and 1600 to 1800 hours in the afternoon. Each total count was completed within three hours in a day using ten or more well trained park scouts. To avoid the problem of double counting during the movement of animals from one block to the other, eight counting blocks were designed based on natural and artificial boundaries, which act as barriers. There are four vegetation types in the Park area: savannah grassland (SGL), grassland with scattered trees (GST), bushland (BL) and riverine forest (RF). Blocks 1 and 2 are mainly with SGL and GST, which are frequently burned by local community while Blocks 6, 7 and 8 are mainly covered with BL and RF. Other Blocks (3, 4 and 5) are with the mixture of all vegetation types with the dominant of GST. Suitable vantage points were also selected and the assistants were assigned to check the movement of animals across the blocks. If there was movement, special remark was taken on the suspected blocks by recording the time and population structure and was checked at the end of the census.

Sex and age structure

During the census of Swayne's hartebeest, detailed observations of the entire herd were made. This enabled to categorize the populations into their respective age groups: adult male and female, sub-adult male and female, young and unidentified sex. To categorize the animals into these groups, the methods of Lewis and Wilson (1979) and Kingdon (1997) were followed. Body size, horn size and shape, fur colour, the presence of scrotum in males or udder in females and other physical features were used as a clue to determine the sex and age of the individuals. Information on the approximate demographic composition and structure, such as age class and sex ratio, were used to predict the general trend of Swayen's hartebeest population to understand whether it is declining, increasing or stable. Population trend of Swayne's hartebeest was determined by comparing the present finding with previous results conducted by different researchers.

Group size

During each total count, the size of each group of Swayne's hartebeest was recorded before further subdividing into the respective sex and age categories. When the distance between individuals was less than 60 metres, they were considered as members of the same group, following the method of Lewis and Wilson (1979) and Borkowski and Furubayashi (1998). Group size data from all observations were collected, tabulated and calculated. All data were analyzed using SPSS version-15.

RESULTS

A total of 372 individuals were counted during the census period. High number of Swayne's hartebeest was observed in Blocks 1 and 2 while the least number (7) was counted in Block 6 (Fig. 3). There is a significant difference in counts between Block 1 and Block 4 (χ^2=16.333, df=1, P<0.001), Block 5 (χ^2=53.342, df=1, P<0.001), Block 6 (χ^2=78.867, df=1, P<0.001), Block 7 (χ^2=65.090, df=1, P<0.001) and Block 8 (χ^2=34.798, df=1, P<0.001) while there is no significant difference between Block 1 and Block 2 (χ^2=0.340, df=1, P>0.001) and Block 3 (χ^2=7.609, df=1, P>0.001). The result indicates that SGL and GST habitat types are more significant in the abundance of Swayne's hartebeests than that of BL and RF habitat types. The population trend shows slight increase compared to the previous work of Befekadu Refera and Afework Bekele (2006). Out of the total individuals observed, 24.5% were adult males (AM), 34.1% adult females (AF), 8.3% sub-adult males (SAM), 13.4% sub-adult females (SAF), 15.6% young and 4.0% were unidentified sex (Fig. 3).

The ratio of adult males to adult females, sub-adult males to sub-adult females, sub-adult males to adult males, sub-adult females to adult females and young to adult females was 1:1.4, 1:1.6, 1:2.9, 1:2.5 and 1:2.2, respectively. The population is female biased. There is no significant difference between the number of male and female hartebeests (χ^2=5.945, df=1, P>0.001) while there is a significant difference between the number of young and adult female hartebeests (χ^2=25.735, df=1, P<0.001).

A total of 139 groups of Swayne's hartebeests were observed in the study area. The variation in group size was from solitary individuals to groups of 27. Highest percentage of individuals were observed alone (17.3%, n=24) compared to other group assemblages (Fig. 4). Although Swayne's hartebeests mainly lived in groups, many solitary individuals were observed, with more solitary adult males than solitary adult females. The difference among the number of hartebeest groups was not significant (χ^2=112.609, df=21, P>0.001).

Swayne's hartebeests were distributed into four habitat types of the Park area, savannah grassland (SGL), grassland with scattered trees (GST), bushland (BL) and riverine forest (RF). The hartebeests were mainly associated with grassland that possesses scattered trees (54%). Generally, there was no significant difference among the association of habitat types (χ^2=65.200, df=3, P>0.001). In contrast, their distribution to the riverine forest was very low (Fig. 5). Most of the individuals were observed on burned area, grazing fresh grasses.

Swayne's hartebeests showed a tendency to associate with oribi, waterbuck, bushbuck, bohor, warthog and lesser kudu that ranged in their habitats. The percentage frequency of such association was more with oribi (68%, n=108) than other ungulate species (Fig. 6).

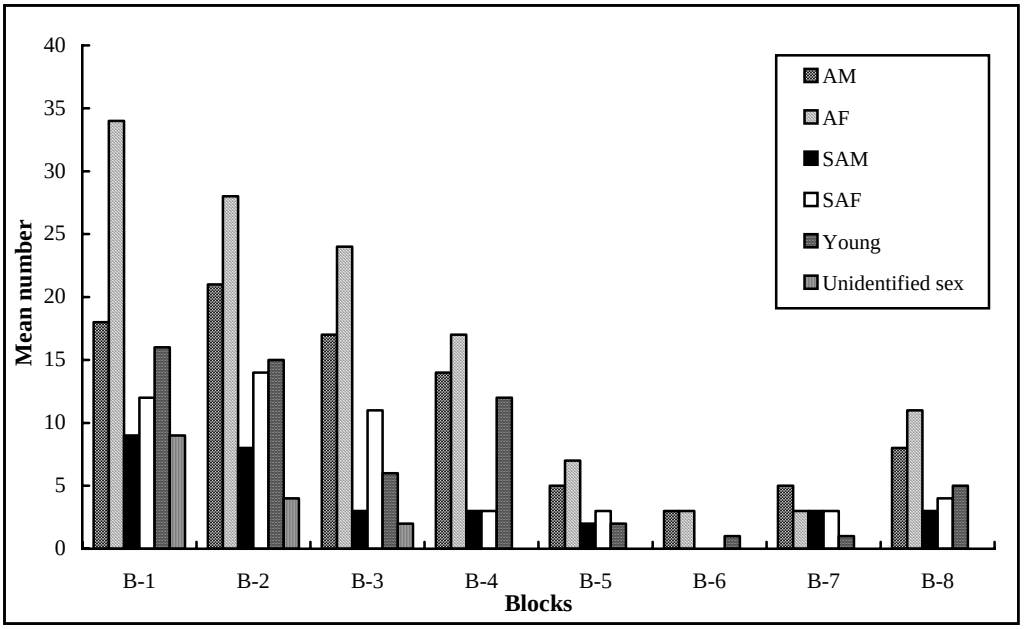

Fig. 3. Swayne's hartebeest population counted in different blocks based on sex and age structure in MNP (AM=Adult male, AF= Adult female, SAF= Sub-adult female, SAM=Sub-adult male and B=Block).

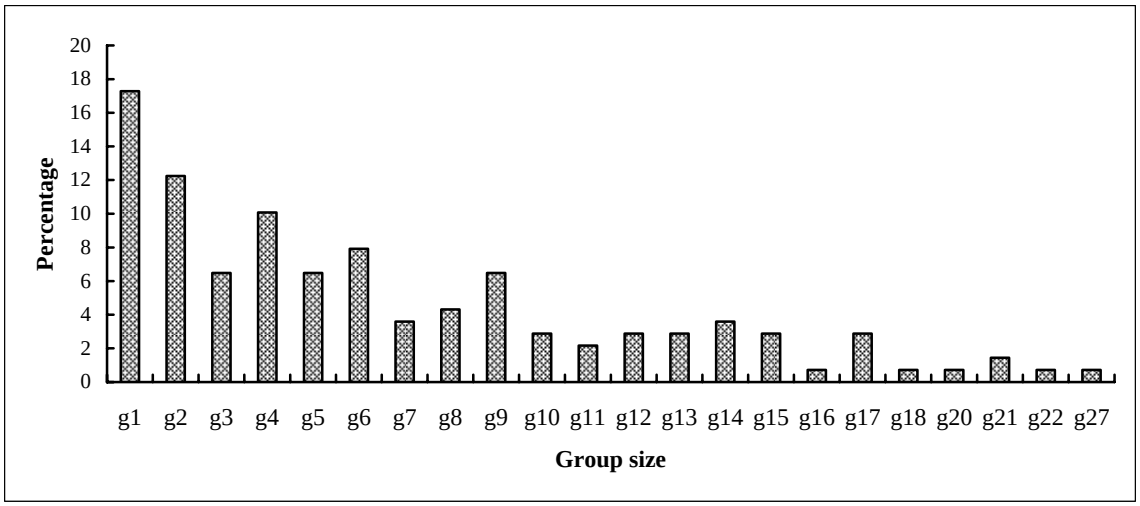

Fig. 4. Group size and percentage of Swayne's hartebeest (g=group size).

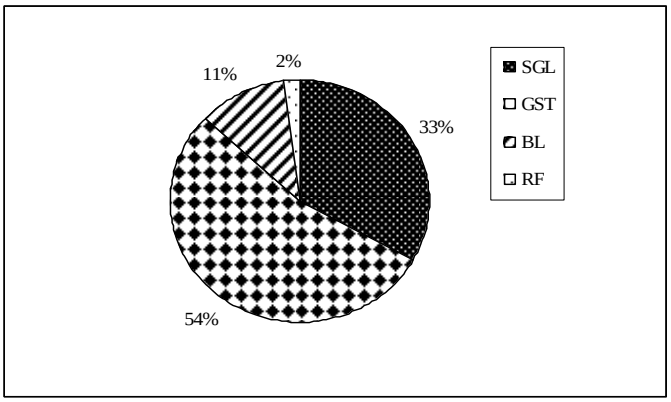

Fig. 5. Percentage of habitat association of Swayne's hartebeest (SGL= Savannah grassland, GST= Grassland with scattered trees, BL= Bushland, RF=Riverine forest).

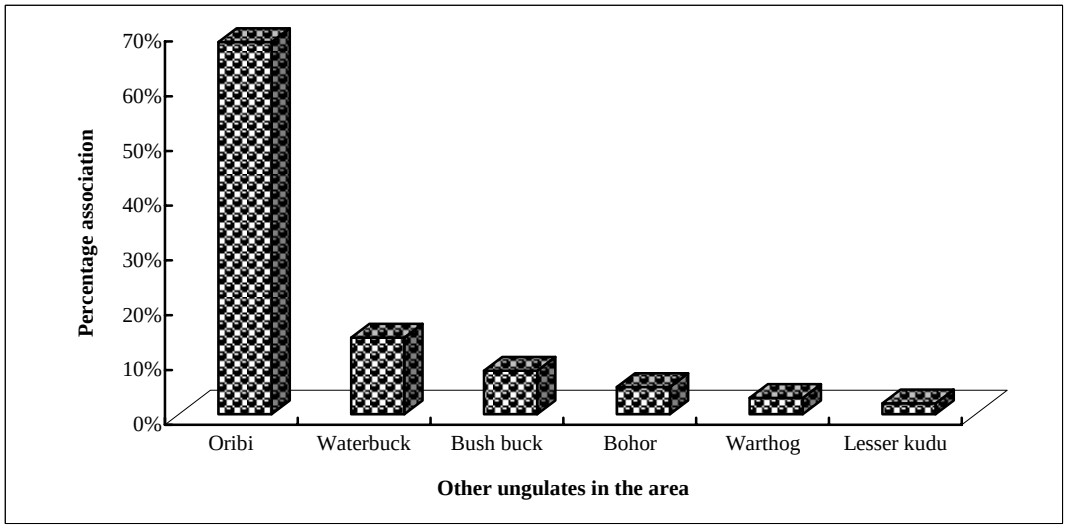

Fig. 6. Frequency of association of Swayne's hartebeests with other ungulates in the Park area.

DISCUSSION

Maze National Park is an important biological area and has great potential for the conservation of the endangered endemic subspecies of Swayne's hartebeest population and other wildlife. Large concentrations of wild mammals in Africa are now found only in national parks and other reserves, which cover about seven percent of the African land area (Happold, 1995). Accurate information on the status of population has become essential to their conservation. Total count method may only be practical for diurnal ungulates such as Swayne's hartebeests inhabiting open country, but even then, not over vast areas.

Monitoring trends in animal populations is a key aspect in the management of wildlife. Acevedo *et al*. (2008) explained that monitoring schemes must generate reliable estimates of abundance to allow assessment of population trends. The current study shows that the Swayne's hartebeest population in MNP has slightly increased from 277 in 2003, counted by Befekadu Refera and Afework Bekele (2006) before the establishment of the Park, to 372 at present. This increase is due to the implementation of strict wildlife management and conservation measures. Park scouts were regularly patrolling the park area to control excessive hunting and other activities for the proper management of the hartebeest's and other wildlife. The reason for the Swayne's hartebeest's population difference along the counting blocks was mainly due to the quality of the habitats, especially access to fresh grass (that is more palatable than coarse grasses), livestock pressure and anthropogenic disturbances.

Under certain circumstances, a bias in the sex ratio can occur favouring either males or females within a population. This can occur at the primary level before birth or at the secondary stage as a result of differential mortality on one of the sexes. Unequal afterbirth sex ratio was discussed by Bergerude (1971). Taylor and Parkin (2008) described the mechanism and implications for sex ratio bias and its impact on differences in the population. In the present study, the overall male-to-female sex ratio skewed more to females. A female-biased sex ratio among adults has been reported in many ungulate populations. Potential bias in sex ratio is of concern in the management of vulnerable and endangered species. Estes (1974) explained that the possible reasons for an unequal sex ratio may be an increased predation pressure on males, due to greater boldness or the emigration of subordinate males to less favourable habitats. This reason might also be the cause for the skewed sex ratio of Swayne's hartebeests at MNP because many solitary and territorial adult males were observed during the study. The large number of breeding females indicates that, if better conservation measure is taken by the Park management and other concerned bodies, the population of Swayne's hartebeests will increase in the future.

Group sizes in each population were measured through total or direct count, as this is a recommended census technique by Sutherland (1996) and Jethva and Jhala (2004) for species like blackbucks that aggregate and inhabit relatively open areas. Reiczigel *et al*. (2008) described that quantifying group size is a straightforward way to characterize animal sociality. The size of social groups varies widely among animals, from populations in which individuals are primarily solitary to those in which most individuals are found in aggregations of many hundreds (Isvaran, 2007). Even though many solitary male hartebeests were observed in the area, most of them were seen with groups up to twenty seven individuals and/or with other groups of different species gathering together. However, the group size of the Swayne's hartebeests in MNP was small compared to other hartebeests living in organized herds of up to 300 animals. According to Ruckstuhl and Festa-Bianchet (2001), the possible benefits to group living include reduced predation risk, maintenance of forage quality, increased hunting success, and better access to information about resources, better defence of resources and reduced risk of infanticide. Isvaran (2007) also discussed that predator avoidance may increase with group size. Feeding rate seemed highest and vigilance lowest in groups of largest individuals. Group sizes should increase with forage abundance and distribution. Animals in groups may have to forage over larger areas and/or spend more time searching for food than solitary animals (Wrangham *et al*., 1993). Both the size of a population and sex-age composition may affect the occurrence of different groups as seen in the hartebeests in Maze.

From the observation of Swayne's hartebeest, fire plays an important role in influencing species-habitat associations. Krishna *et al*. (2008) stated that fire is a complex phenomenon that

affects both the structure and composition of habitats. Jarman (1984) described that animals must get enough food, of a sufficient quality, for an appropriately low expenditure of time and energy on moving and searching. The result on habitat association strongly supports that Swayne's hartebeests prefer mainly the burned grassland habitat with scattered trees in which new fresh grasses grow for their ease foraging access and form a better hiding places for protection from predators. However, hartebeests were not frequently observed in bushland and riverine forest habitats probably due to less access of palatable grasses and risk of predators.

Bicca-marques and Garber (2003) explained that the primary benefits of forming a mixed-species troop may include enhanced vigilance against predators, as well as increased ability to defend productive feeding sites. Swayne's hartebeests associate with oribi more frequently than with other wild herbivores. The two species are not ecological competitors as revealed from different feeding strategies (Frey, 2000). Swayne's hartebeests feed on taller grasses and are exceptionally tolerant to poor-quality food while oribi feed on shorter grasses. This is a general hypothesis that links social organization with feeding ecology in African ungulates and body size. Small species need high-quality food to maintain a relatively high metabolism and therefore graze selectively on grassland. In addition, oribi and other ungulates may gain dilution effect of predation when associated with large herds of Swayne's hartebeests. Oribi was also observed alarming hartebeests from human and predator approach. Isvaran (2007) discussed that grouping within and/or association with other animal groups may reduce predation risk through earlier detection of predators, dilution and confusion effects, and/or cooperative defence.

The information gathered from the Park office and staff, the local community and personal observations indicated that uncontrolled fire, poaching, deforestation, illegal farming, livestock abundance and vehicle-wildlife collision were the important threats in the Park area. The local community set fire deliberately during the dry season and just before the rainy season to burn the vegetation in order to stimulate new and fresh leaves and grasses for their livestock population. During the study, fire was set in the Park area without any firebreak and at night when most animals were inactive, which may affect calves because such time is the period when the hartebeests give birth. Main and Tanner (2003) described that uncontrolled fires may move fast and pose a greater risk to wildlife. Hartebeests had benefited from the fire as evidenced by the dramatic shift in habitat utilization from the unburned area to the freshly burnt area to get fresh shoots. In fact, fire will positively influence Swayne's hartebeests and other wildlife populations in MNP if it is only used properly with controlled (prescribed) burning by the Park management.

Illegal hunters from the local community and from various ethnic groups coming from different neighbouring Weredas, poach hartebeests and other wild animals for traditional purposes and to obtain food. Mesochina *et al*. (2003) explained that poaching is the main cause of decline or extinction of desert antelopes. Therefore, illegal hunting activity for meat might be one of the most important threats for the future decline of Swayne's hartebeest population in MNP, if it is not strictly controlled. Illegal farming practices by the community around the Maze River and other small tributaries along the riverine vegetation are also other main problems of the Park. People settle temporally along such areas for shifting cultivation. In the Park area, people cut trees deliberately for fuel-wood collection, charcoal production and building materials. Local communities regularly herd large number of livestock in the Park area for grazing and drinking water access. Another serious threat of hartebeests and other wildlife in the Park area is highway crossing through the Park. Large numbers of animals have been observed colliding with vehicles that pass through the Park with high speed, especially during the night. During the study period, within four months, ten different species of animals were observed on the main road killed by vehicles. Wildlife collisions can be anticipated and avoided more successfully in MNP if vehicles run at lower speeds and by introducing road breaks within a limited interval on the road. Even though the Park management was established by the regional government, there is an urgent need for further study to evaluate the threat status of the endangered endemic subspecies of Swayne's hartebeests in MNP for future conservation. For endangered species, understanding the causes of threat is crucial to the development of effective conservation management.

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