POPULATION DYNAMICS

INTRODUCTION

Population, definition: "A population is a group of individuals of the same species which live together at the same time and in the same place" (Berryman, 1981).

Populations of wild animals in nature have developed a social structure which promotes the optimum production of young (Bothma 1996). Outside of a natural situation, wildlife managers need to find the balance within each species which promotes their optimum production. Bothma (1996) has laid out guidelines for this purpose.

Sex and age ratios are an important aspect of a population since they indicate whether the population is increasing, decreasing or remaining stable (Herbert 1970). Sex ratio corresponds to the type of reproduction system and bond between the sexes (Leuthold 1997). An imbalance in the sex ratio of animals often leads to poor mating frequency, especially in species where males have a harem of females. Sex ratios should be monitored on a game ranch from year to year to ensure optimal production of the animals (Bothma 1996).

Age structure is important since the reproductive potential of an animal species varies in accordance with age. The maintenance of a healthy age structure in a population is essential (Bothma 1996).

The function of animal populations is to ensure maximum productivity and performance (Bothma 1996).

There are three potential problems which require management of populations:
Conservation - increase populations which are decreasing
Harvesting - to obtain a proportion of the population on a long term basis, sustained yield.
Control - too many animals

OBJECTIVES

The objectives of this study are as follows:

To determine the sex ratio of the selected animal species
To determine the age structure of the selected animals.
To determine if any changes in herd size are apparent throughout the seasons.
To make management recommendations using the results.

METHODS

The methods used in this study was sexing and aging animals by means of field observations using binoculars.
The survey took place simultaneously with the habitat selection surveys, with each group of animals being sexed and aged and the information being filled out in an observation sheet (Appendix 2). The age classes which the animals were divided into was:
Juveniles or calves
Sub-adults
Adults

Herd sizes were noted.

Animals were sexed and aged using a number of methods, the differences in sexes primarily determined by:
Horn presence or absence (Van Rooyen 1990)
Horn structure (thickness, rings etc) (Dieckmann 1980; Du Plessis 1968)
Presence or absence of a penile sheath (Dieckmann 1980)
Tail tufts, e.g. blesbok (Du Plessis 1968)
General build (Du Plessis 1990, Smuts 1974)
Colour differences (Du Plessis 1968)
Young calves were especially difficult to sex and the method of Dieckmann (1980) was used, that is to sex the young animals opportunistically, such as when the calf is urinating.

Age classes were assessed by:
Height of animal in comparison with the adults wither (Dieckmann 1980)
Horn development (Hillman 1979)
Colour differences (Dieckmann 1980)

Results

Herd Sizes

Zebra had the largest herd sizes in summer, with the mean herd size being 12 individuals and the biggest herd totalling near 30 animals (Figure 44a). Herd sizes were also fairly large in spring, but decreased in autumn and even more in winter, with the mean herd size being 3.8 individuals and the largest herd totalling 8.5 zebra.

In summer and autumn impala were observed in the largest herds of the year, with maximums of 35 (mean = 15.8) and 34 (mean=15.6) animals respectively (Figure 44b). In winter and spring these numbers decreased, with winter herd sizes averaging 10.3 and spring averaging 10.4 individuals.

An average of nine giraffe per herd was observed in autumn, with a maximum of 15 giraffe seen in one herd (Figure 45a). The other seasons show markedly less giraffe per herd, in particular winter and spring where herd sizes averages at 2.6 and 3 individuals. The smallest herd sizes were seen in spring, where lone bulls were frequently observed.

The largest congregation of kudu was in the summer and spring seasons, with herds numbering over 8 individuals (Figure 45b). Winter and autumn showed observations of slightly smaller herd sizes. The smallest herd size recorded was in autumn for a group of 2 individuals.

Herd sizes of blue wildebeest were fairly uniform throughout the year, with the highest recorded herd size being in autumn of 25 individuals and the smallest herd being in winter with four individuals (Figure 46).

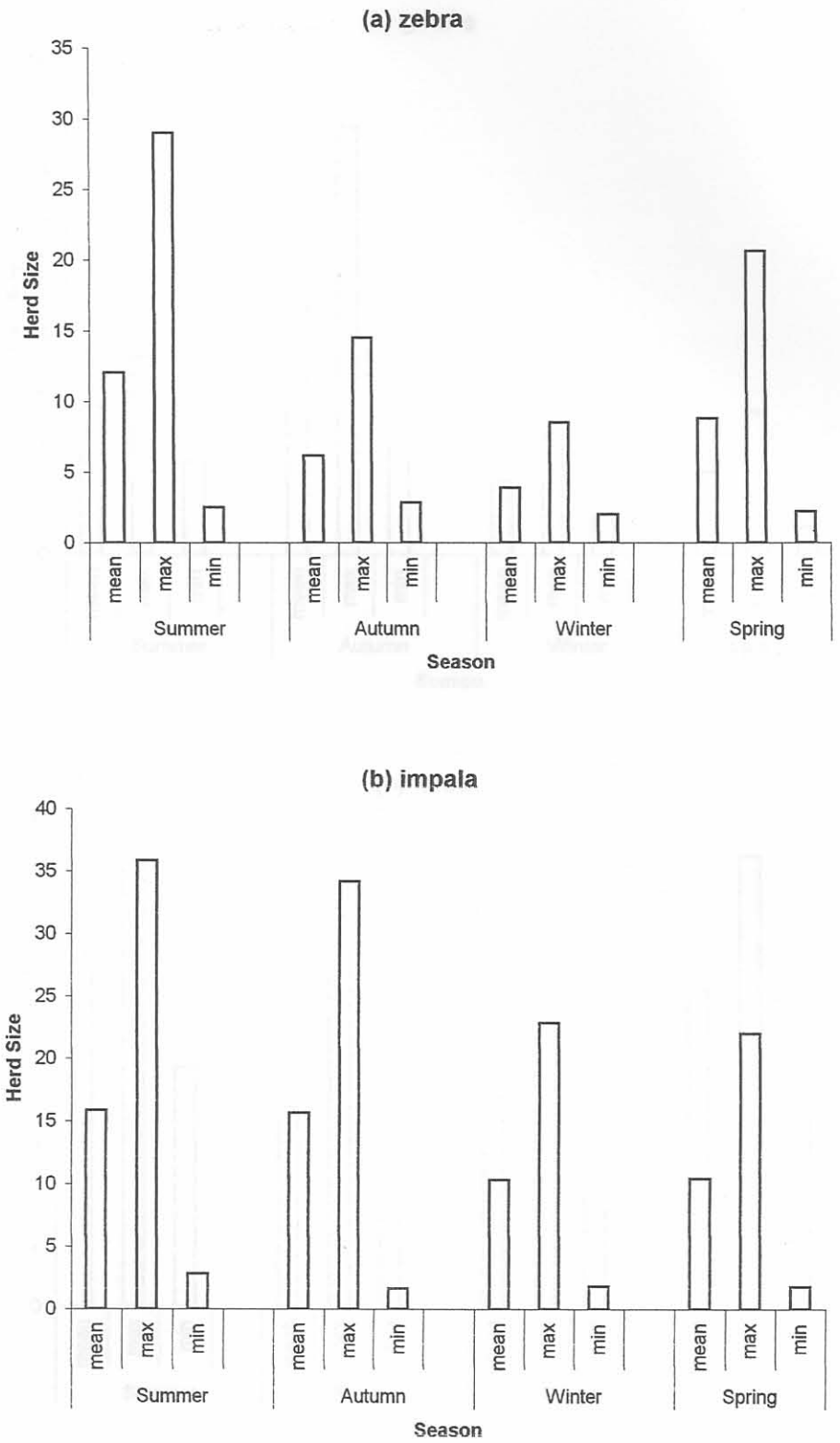

Figure 44. Mean, minimum and maximum herd sizes of (a) zebra and (b) impala over the four seasons

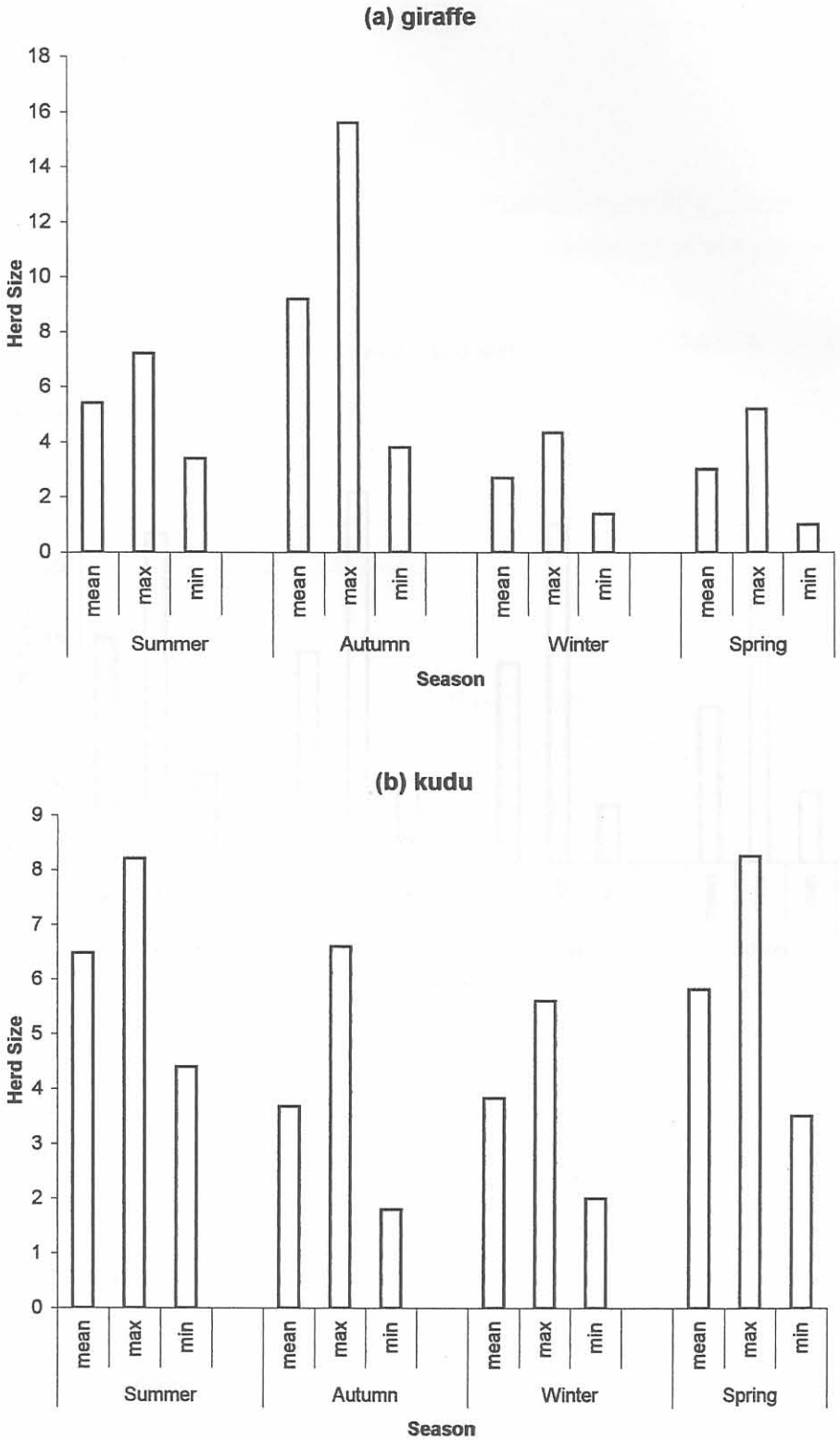

Figure 45. Mean, minimum and maximum herd sizes of (a) giraffe and (b) kudu over the four seasons

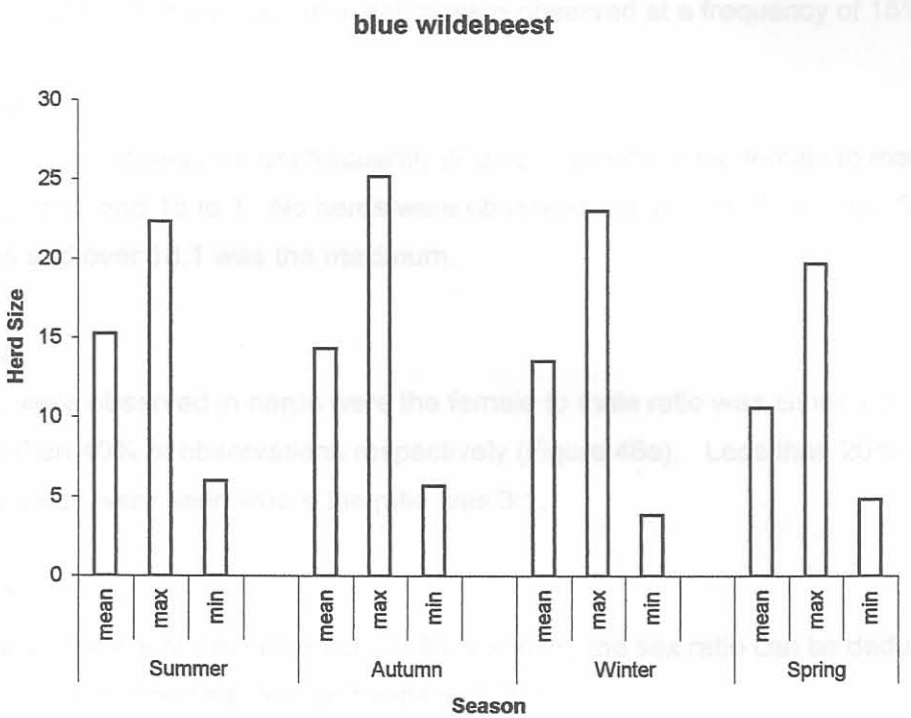

Figure 46. Mean, minimum and maximum herd sizes of blue wildebeest over the four seasons

Sex Ratio

Zebra

The results of investigating sex ratios of adult zebra (Figure 47a), show that the highest frequency of observations were for a ratio of 1 : 1 female zebra to male zebra, with a frequency greater than 40%.

2 : 1 and 3 : 1 females per male zebra were observed at a frequency of 15% each.

Impala

Impala were observed most frequently (Figure 47b) where the female to male ratio was between 10 and 15 to 1. No herds were observed with a ratio of less than 5:1 female to males and over 18:1 was the maximum.

Kudu

Kudu were observed in herds were the female to male ratio was either 1:1 or 2:1 for more than 40% of observations respectively (Figure 48a). Less than 20% of the time kudu herds were seen where the ratio was 3:1.

Giraffe

Because the entire population of giraffe is known, the sex ratio can be deduced directly. The sex ratio of female to male giraffe is 1.25:1

Blue wildebeest

Blue wildebeest were observed in herds where the female to male ratio was predominantly 7:1 or 8:1 (for more than 30% of observations) (Figure 48b).

Age Structure

Zebra

As seen in Figure 49a 51% of the zebra population is made up of adult zebra, while 21% and 28% are made up of juveniles and sub adults respectively.

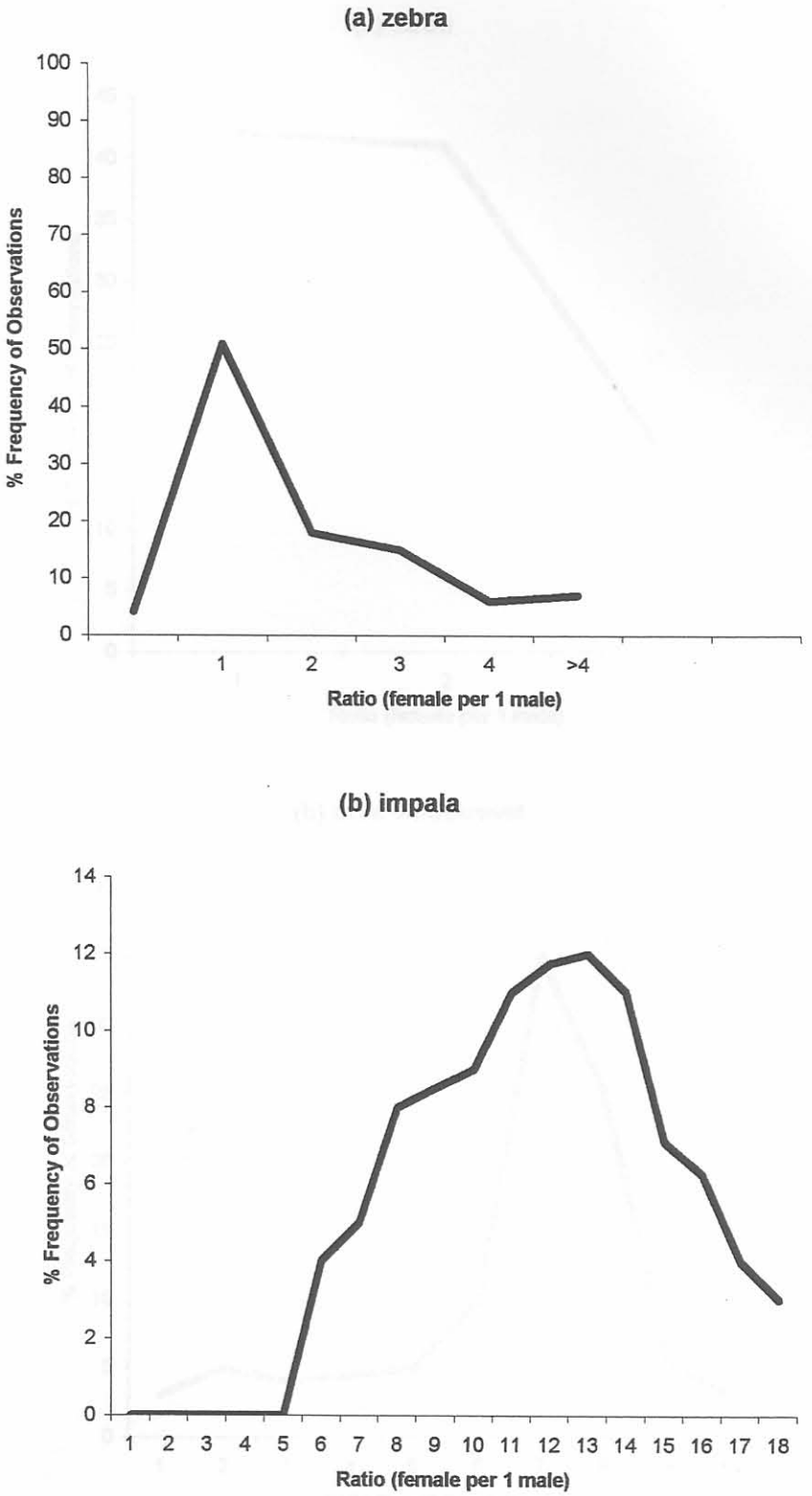

Figure 47. Frequency distribution of sex ratios of (a) zebra and (b) impala

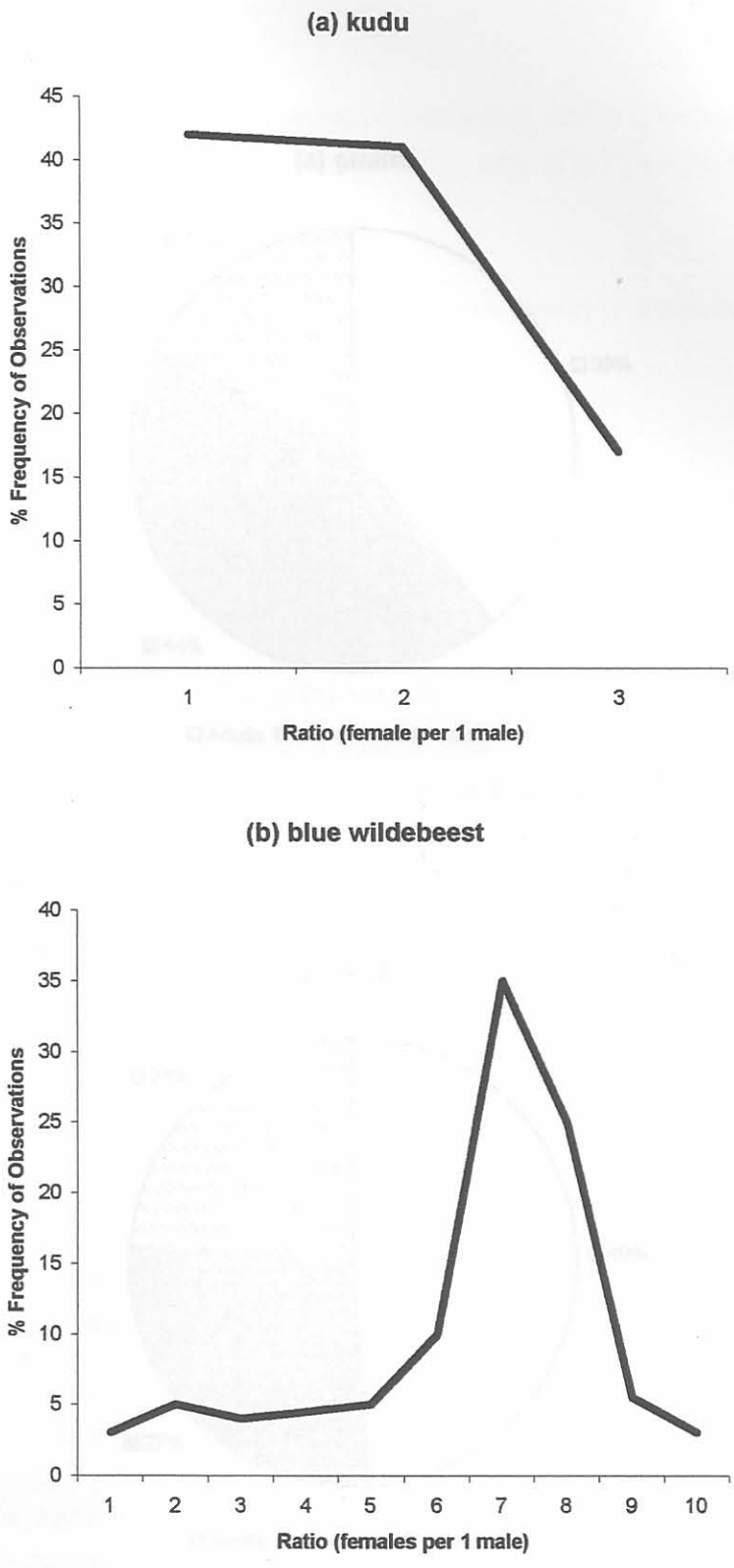

Figure 48. Frequency distribution of sex ratios of (a) kudu and (b) blue wildebeest

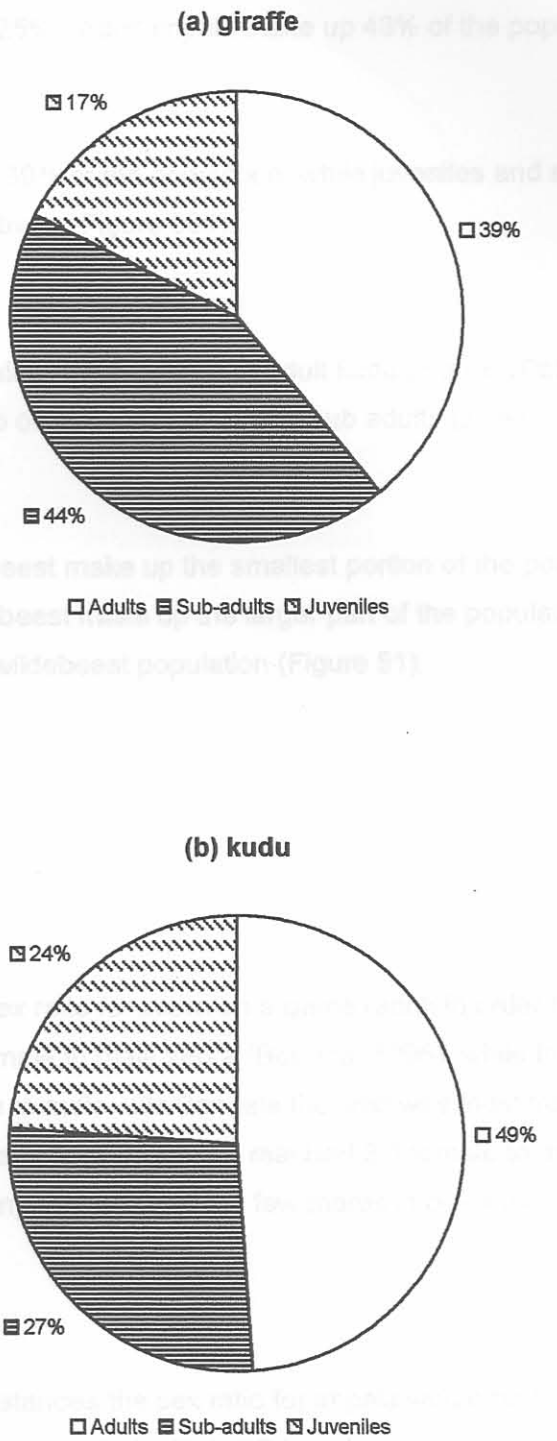

Figure 50. Age structure of (a) giraffe and (b) kudu

Impala

Juvenile impala make up 32% of the impala population, which is very close to the sub adults, who make up 25%. Adult impala make up 43% of the population (Figure 49b).

Giraffe

Adult giraffe make up 39% of the population, while juveniles and sub adults make up 17% and 44% respectively (Figure 50a).

Kudu

49% of the kudu population is made up of adult kudu (Figure 50b) the remaining population is made up of juveniles (24%) and sub adults (27%).

Blue wildebeest

Sub adult blue wildebeest make up the smallest portion of the population with 24%, while adult blue wildebeest make up the larger part of the population, 44%. Juveniles make up 32% of the wildebeest population (Figure 51).

Discussion

Sex Ratio

Zebra

The recommended sex ratio for zebra on a game ranch in order to have optimum productivity is 6:1 female to male zebra (Bothma, 1996), while in nature, the ratio is closer to 1.5:1 female to male. On Sondela the ratio was most frequently less than even the natural sex ratio, and less frequently reached 3:1 female to male zebra, indicating that there are too many stallions and too few mares in order for production to be optimum.

Impala

Under natural circumstances the sex ratio for impala would be 1.5 - 2.0 female to male impala, while the recommended ratio is 10 females per one male. On Sondela the ratio is on the recommended and slightly above.

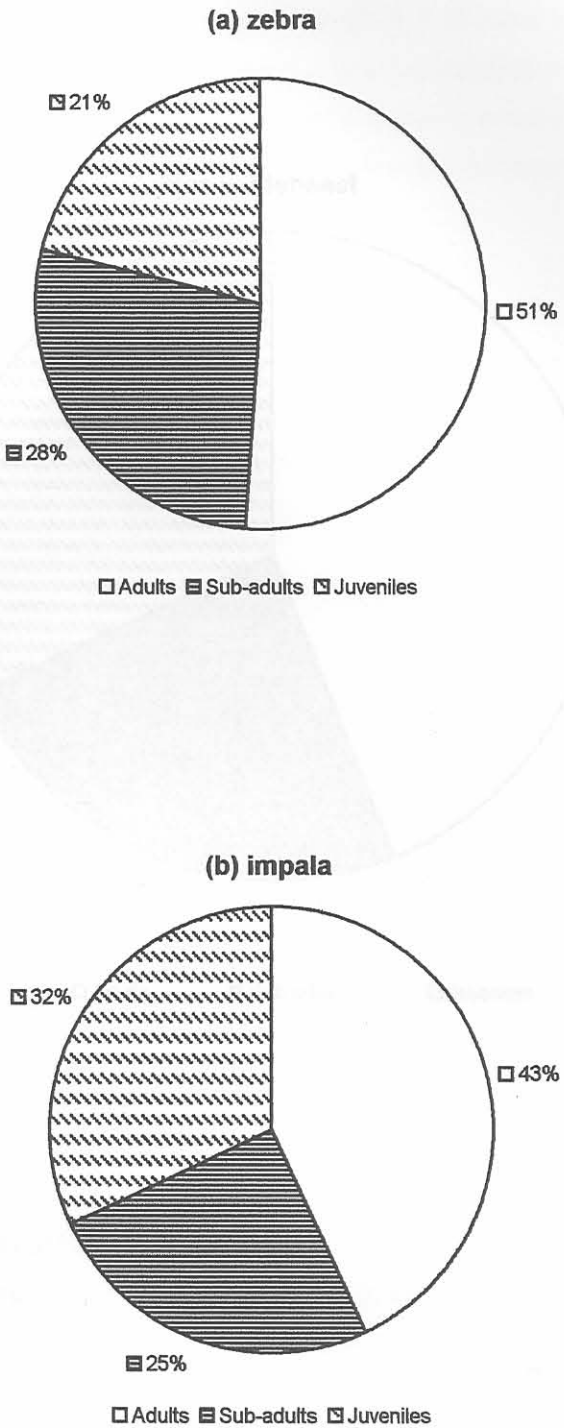

Figure 49. Age structure of (a) zebra and (b) impala

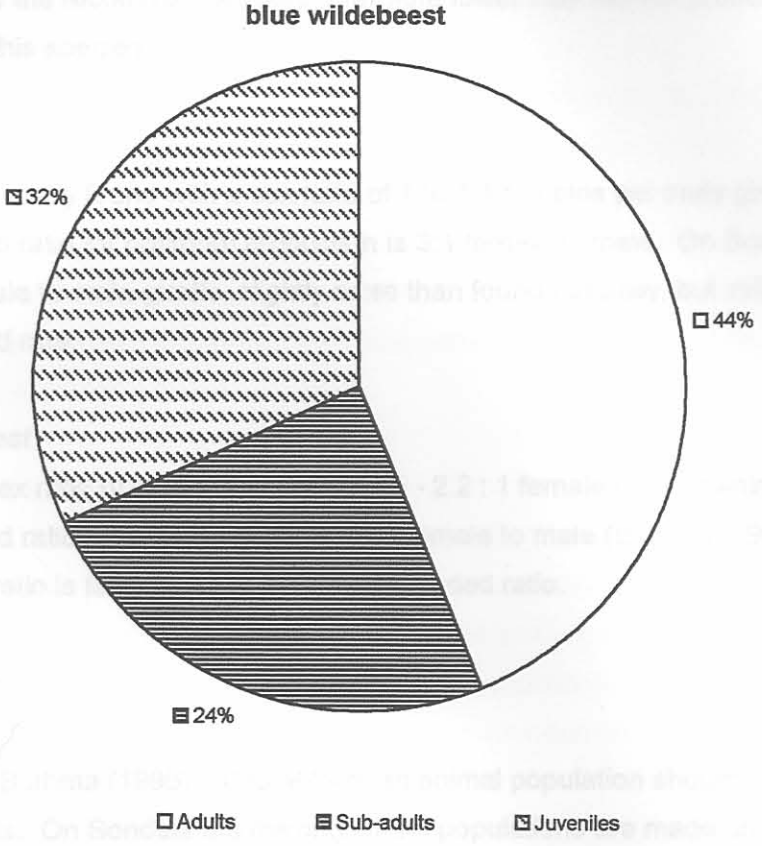

Figure 51. Age structure of blue wildebeest

Kudu

The recommended ratio for kudu on a game ranch is 1:10 male to female kudu. Under natural circumstances the ratio is between 1.4 and 1.8 females per male.
On Sondela the ratio is slightly higher than would occur in natural circumstances, but is still well below the recommended ratio, therefore lower than normal production can be expected for this species.

Giraffe

Giraffe are naturally found with a sex ratio of 1 to 1.1 females per male giraffe. The recommended ratio for optimum production is 3:1 female to male. On Sondela the ratio is 1.25:1 female to male giraffe, slightly more than found naturally, but still below the recommended rate.

Blue wildebeest

The natural sex ratio of blue wildebeest is 1.5 - 2.2 : 1 female to male animals, while the recommended ratio for a game ranch is 10:1 female to male (Bothma, 1996). On Sondela the ratio is fairly close to the recommended ratio.

Age Structure

According to Bothma (1996), 30 to 40% of an animal population should be made up of young animals. On Sondela the majority of the populations are made up of young animals, indicating an incredibly fast growth period. This also leaves the population at risk to factors affecting young animals only.

Zebra

The zebra population of Sondela has 49% of its population consisting of sub adult and juvenile zebra, leaving the population at danger to sudden mortalities of the young.

Kudu

The kudu population is made up of 51% of young animals. Should a disease or any other nature affect the young animals, the population will be in serious trouble.
49% of the kudu population is made up of adult kudu the remaining population is made up of juveniles (24%) and sub adults (27%).

Giraffe

Adult giraffe make up 39% of the population, while juveniles and sub adults make up 17% and 44% respectively.

Impala

Juvenile impala make up 32% of the impala population, which is very close to the sub adults, who make up 25%. Adult impala make up 43% of the population.

Blue wildebeest

Sub adult blue wildebeest make up the smallest portion of the population with 24%, while adult blue wildebeest make up the most part of the population, 44%. Juveniles make up 32% of the wildebeest population.

Management recommendations

In order to increase the productivity of zebra, kudu and giraffe on Sondela Nature Reserve, it is necessary to add more females to the existing herds, thus increasing the ratio of female to male animals and increasing the production rate. Impala and blue wildebeest herds on Sondela are close to the recommended rate and productivity should be optimum already.

Most of the herds show a high percentage of juveniles and sub adults in the population, indicating a fast growth period, but which also leaves it very vulnerable should the young be affected by disease or other mortalities. Sondela frequently captures game to be sold at auctions and during any future captures should make sure that mature animals are not removed in excess.