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SEX AND AGE DATA FROM CROPPING OF BUFFALO *Syncerus caffer* IN THE KRUGER NATIONAL PARK

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Abstract — Sex and age classifications of buffalo cropped in the Kruger National Park suggest that cropping is biased towards females, and prime breeding individuals of both sexes are apparently under-represented. The implications are discussed in relation to buffalo social organisation and comparative data on population structure.

Introduction

Regular aerial censuses in the Kruger National Park (KNP), Republic of South Africa, have shown a predominantly upward trend in the buffalo (*Syncerus caffer*) population numbers during the 1970's, culminating in a peak figure of 34 912 in September 1981. In accord with management policy designed to maintain maximum ecological productivity and diversity among plant and animal communities in the KNP, buffalo cropping was started during 1966 and subsequently expanded in an attempt to stabilise the population. Cropping operations from September 1981 to August 1982 accounted for 5 323 buffalo and the aerial census indicated a population of 32 862 animals in September 1982. A further 1 352 buffalo were then removed until February 1983 when cropping was suspended pending construction of new facilities at the depot near Skukuza where the carcasses are processed.

A target stocking rate of some 25 000 buffalo is envisaged as probably optimal for the KNP during a dry year. However, the extent to which cropping quotas are representative of the sex and age structure prevailing in the population has not been critically examined. Excessively biased removal of different sex and age classes could cause eventual population imbalance and limit the scope of natural population regulatory mechanisms. A well-bal-

anced sex and age distribution in the population is also important for reproduction.

Material and methods

All buffalo were killed by darting them from a helicopter with an overdose of succinylcholine chloride and then cutting their throats to exsanguinate them. With large herds in terrain difficult for the transport vehicles, a segment comprising at least double the number of animals to be cropped is separated and may be driven for up to 2 km towards a road or an open area where usually about 30-40 individuals are then darted without regard to sex or age class. Between 16 June 1982 and 18 February 1983, 2 693 buffalo (out of a total of 2 796 cropped) were sexed and classified into nine age classes by examining their eviscerated carcasses upon delivery at the processing depot. The sample excludes specimens condemned due to foot and mouth disease and left in the field.

Age classes were assigned to cropped buffalo using diverse criteria, particularly body size, horn development and eruption sequence and wear of the incisor and canine teeth, as described by Pienaar (1969), Grimsdell (1973a) and Sinclair (1977). Since calving by buffalo in the KNP is distinctly seasonal with a peak during January and February (Fairall 1968; Pienaar *op. cit.*), animals up to five years old were easily allocated to year classes.

Results

Numbers, sexes and age classes of buffalo cropped during the study period are given separately for each month when cropping was undertaken (Table 1). Juveniles (birth – 12 months), yearlings and 2 – 3 years old buffalo comprised respectively 11,5%, 16,7% and 27,6% of the total sample, compared with only 4,7% for individuals aged five years and older. Animals 3-4 years old and 4-5 years old comprised 39,4% of the study sample.

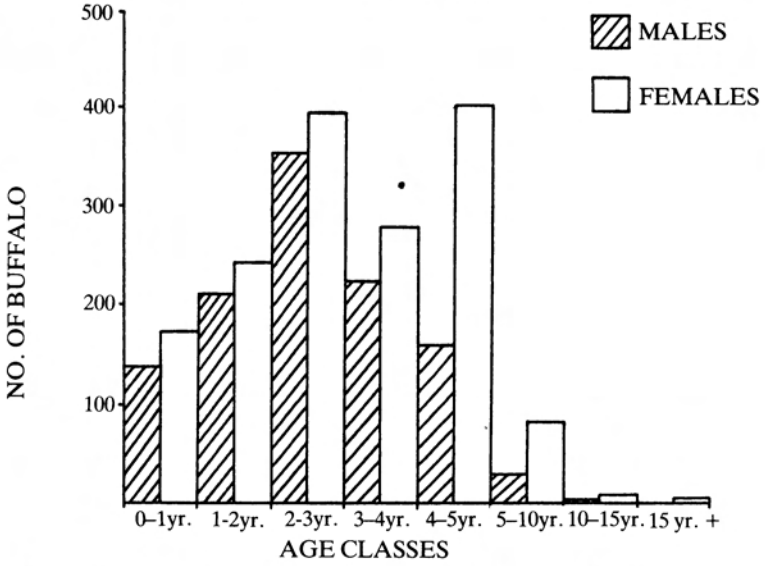

Fig. 1. Histogram showing age distribution of buffalo cropped in Kruger National Park during the period June 1982 to February 1983.

Table 1

Sex and age classifications of buffalo cropped in Kruger National Park during the period June 1982 to February 1983

DATE	*0-4 mo.*		*4-12 mo.*		*Yearling*		*2-3 yr.*		*3-4 yr.*		*4-5 yr.*		*5-10 yr.*		*10-15 yr.*		*15 yr. +*	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
1982																		
June	2	9	26	25	29	33	47	53	18	26	17	22	9	20	0	3	0	1
July	5	6	44	49	70	72	61	86	54	67	25	77	7	10	1	1	0	1
August	1	2	18	32	30	32	53	52	40	49	26	52	6	11	0	1	0	0
October	0	2	7	5	11	9	12	15	12	26	9	27	2	11	0	1	0	0
November	0	3	19	27	14	28	47	34	36	40	26	82	4	21	0	1	0	0
Sub-totals	8	22	114	138	154	174	220	240	160	208	103	260	28	73	1	7	0	2
1983																		
January	3	1	4	5	23	33	74	98	33	37	23	65	0	3	0	0	0	2
February	6	3	2	4	33	34	57	55	30	33	33	76	1	8	0	1	0	1
Sub-totals	9	4	6	9	56	67	131	153	63	70	56	141	1	11	0	1	0	3
TOTALS	17	26	120	147	210	241	351	393	223	278	159	401	29	84	1	8	0	5

Females predominated throughout the age distribution of the cropped buffalo (Fig. 1), and especially within the 4 – 5 years age class. Males comprised 45,9% of buffalo up to four years of age (n = 2 006), whereas only 27,5% of buffalo aged four to 15 or more years (n = 687) were males. The sex ratios of buffalo in the different age classes are summarised in Table 2.

Table 2
Sex ratios in relation to different age classes for buffalo cropped in Kruger National Park during the period June 1982 to February 1983

Age class	*Number classified*	*Sex ratio* ♂♂:♀♀	X^2	*P*
0 – 1 yr.	310	44,2:55,8	4,18	<0,05
1 – 2 yr.	451	46,6:53,4	2,13	>0,10
2 – 3 yr.	744	47,2:52,8	2,37	>0,10
3 – 4 yr.	501	44,5:55,5	6,04	<0,02
4 – 5 yr.	560	28,4:71,6	104,58	<0,001
0 – 5 yr.	2 566	42,1:57,9	64,24	<0,001
5 – 15 yr. +	127	23,6:76,4	35,35	<0,001
Overall	2 693	41,2:58,8	83,08	<0,001

Discussion and conclusions

Although buffalo population dynamics in the KNP merit intensive study on a long-term basis, no recent data on sex and age ratios from field classifications are available for comparison with the data from cropped specimens. In the buffalo population of the Serengeti National Park, Tanzania, Sinclair (1977) found that the sex ratio at two years of age was still approximately equal (1:1) as judged from ground counts; estimated ages at death from a collection of found skulls representing natural mortality showed that survival rates for the two sexes remained essentially similar until about 16 years of age. Thus, assuming an equal sex ratio at birth, the disparate sex ratios recorded for cropped buffalo in the KNP could arise from female-biased cropping, especially for buffalo older than four years (Fig. 1, Table 2). The cropped sample contains only a small proportion (4,2%) of prime breeding individuals (both sexes) from the 5 – 10 years age class, whereas 20,8% were from the 4 – 5 years age class alone. Pienaar (1969) reported only one pregnant buffalo younger than five years in a sample of 53 females from the KNP. Studies in Uganda, Tanzania and Botswana have shown that 50% of buffalo of both sexes attain sexual maturity between four and five years of age (Grimsdell 1973b; Sinclair 1977; Carmichael, Patterson, Dräger & Breton 1977).

Of the 32 862 buffalo counted by aerial survey in the KNP in September 1982, bachelor bulls comprised 8,2%, while the remainder were in breeding

herds (which contain mainly females and young). Allowing for seasonal variation, similar proportions of bachelor males have been reported in buffalo populations elsewhere, *viz.* 5,0 – 6,1% in the Queen Elizabeth (Ruwenzori) National Park, Uganda (Eltringham & Woodford 1973) and at least 5,7% in the Serengeti (Sinclair 1977). According to Sinclair (1974, 1977), older male buffalo cease reproduction after about 10 years of age and live virtually permanently away from the breeding herds; the younger adult males compete for mating priority *via* a dominance hierarchy and may comprise 10% to 15% of breeding herds. Many prime adult males join bachelor groups during the dry season, but they usually return to the breeding herds before the beginning of the next mating period, leaving only the old males in the bachelor groups.

Because no sex and age classifications were undertaken between March and May, the period when most conceptions occur in the KNP (Pienaar 1969), prime bulls aged 5-10 years may have been under-represented in the sample of cropped buffalo examined. Nevertheless, the 1,1% occurrence of 5 – 10 years old males among the 2 693 cropped buffalo classified is remarkably low and is probably indicative of non-random cropping. When buffalo cropping was initiated in the Crocodile Bridge section of the KNP during 1966, a special effort was made to obtain a sample representative of the prevailing population structure by randomly selecting individuals from a herd and then darting them from a vehicle; of the 100 buffalo that were cropped in this manner from five different herds between March and August of that year, 35% were bulls at least four years old while bulls aged six years and older comprised 25% of the sample (Pienaar 1969). In contrast bulls aged at least four years comprised 7,0% of the sample of cropped buffalo classified during 1982/1983. This is also much less than the 24,2% to 39,2% occurrence of bulls aged at least four years reported by Pienaar (*op. cit.*) in sample classifications obtained from aerial photographs and field observations of four breeding herds.

Examination of aerial photographs of buffalo breeding herds suggests that the different sex and age groups are not randomly distributed throughout the herd. Sinclair (1974, 1977) reported sub-groups of adult males within breeding herds and noted post-weaning family ties which could possibly continue much longer between females. When breeding herds are disturbed by the helicopter and start moving in a particular direction, the group cropped could therefore be from a section of the herd that is not representative of the overall herd structure. A number of field staff have expressed concern that mature bulls in the breeding herds may be under-exploited and moreover, cropping is virtually confined to breeding herds rather than small bachelor groups.

Some of the sex ratio bias in the cropped sample could arise if adult bulls tend to lag towards the rear when a herd is driven over some distance. However, the apparent age bias reflected by the very poor representation of buffalo of breeding age (more than five years) in the cropped sample in relation to their likely occurrence in the population is less readily explained.

Further research is needed to substantiate the indications that buffalo population control is biased *vis-à-vis* the prevailing sex and age structure. When

cropping is resumed (during the latter half of 1983) sex and age data should be accumulated until adequate comparison is possible with concurrent sample classifications of buffalo from the ground and from aerial photographs of breeding herds during both wet and dry seasons. Buffalo population structure could also be assessed by capturing several large herds in an opaque plastic boma (Densham 1974) and culling the entire herd once in the boma, which has proven an effective removal technique for buffalo in Zimbabwe (Cumming *pers. comm.*)*. Should trends towards differential removal of sex and age classes continue to be manifest, the cropping technique may need to be modified to make removal as random as possible, thereby allowing maximum scope for natural adjustments of the population structure to changing environmental circumstances.

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