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Springbok, *Antidorcas marsupialis* (Zimmerman, 1780) from the past

By Ina Plug

Department of Archaeozoology, Transvaal Museum, Pretoria, South Africa

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Abstract

Analysed 6000 springbok, *Antidorcas marsupialis* (Zimmerman, 1780), bone fragments from an archaeological site in South Africa. This enabled deductions on herd composition and seasonality of springbok from the period before settled farming and large scale hunting disrupted herd mobility and reduced numbers. Techniques of osteomorphology and osteometry were used to compare the archaeological bone with modern skeletal material. The results show that the excavated remains are predominantly from foetal, neonate and adult individuals. On average the animals from the archaeological samples were somewhat smaller than modern springbok females, suggesting that most of the animals in the archaeological samples were also females. The age profiles and the large numbers of foetal and neonate individuals indicate that the assemblage was taken from lambing herds. Climatological and environmental conditions of the region indicate that these herds visited the area during spring and early summer on a seasonal basis. They were not part of the occasional mass movements, or smaller mixed herds, as such herds consist of animals of both sexes and all ages.

Introduction

Archaeozoological and palaeontological studies provide information on the anatomy of wild animals from the past, but most samples are too small to allow deductions on herd composition, behaviour and average sizes of the animals. The large sample of springbok, *Antidorcas marsupialis* (Zimmerman, 1780), bones from an archaeological site provided an unique opportunity to determine if such deductions can be made on larger samples, and to compare the results with those of modern springbok studies and historical observations.

The distribution of springbok in South Africa is mainly restricted to game reserves and farms where herd mobility and herd size are limited. Little is known about structure and behaviour of free roaming herds in the past. Until 1950, in the Kalahari Gemsbok Park and Botswana, springbok sporadically congregated in their thousands and mega-migrations occurred (Conwright-Schreiner 1925; Child and Le Riche 1969; Bigalke 1972). Springbok herds of the Kalahari Gemsbok Park, consist of individuals of both sexes and all age groups, with the exception of neonates. These herds are small in winter and larger in summer when the grazing is good. At the start of the lambing season females congregate and male animals of six months and older are driven off to form bachelor herds (Skinner and Smithers 1990). A few territorial males remain with the females. The lambing season may vary from region to region, but most lambs are born between September, at the beginning of the rainy season, and January, with the highest peak in October. Females of a particular herd usually drop their lambs within one or two months (van Zyl and Skinner 1970; Skinner et al. 1974; Skinner et al. 1977).

Material and methods

The springbok bones, other faunal remains and artefacts of hunter-gatherer communities were retrieved from Abbot's Cave (ABB) in the Seacow Valley, Karoo, South Africa, (31°27′ S, 24°39′ E)

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(Fig.). Most of the deposit dates to between 1270 and 1682 AD, predating European contact and the establishment of demarcated farms (Sampson and Vogel 1989; Sampson et al. 1989; Plug 1993). The samples therefore reflect the past fauna endemic to the region.

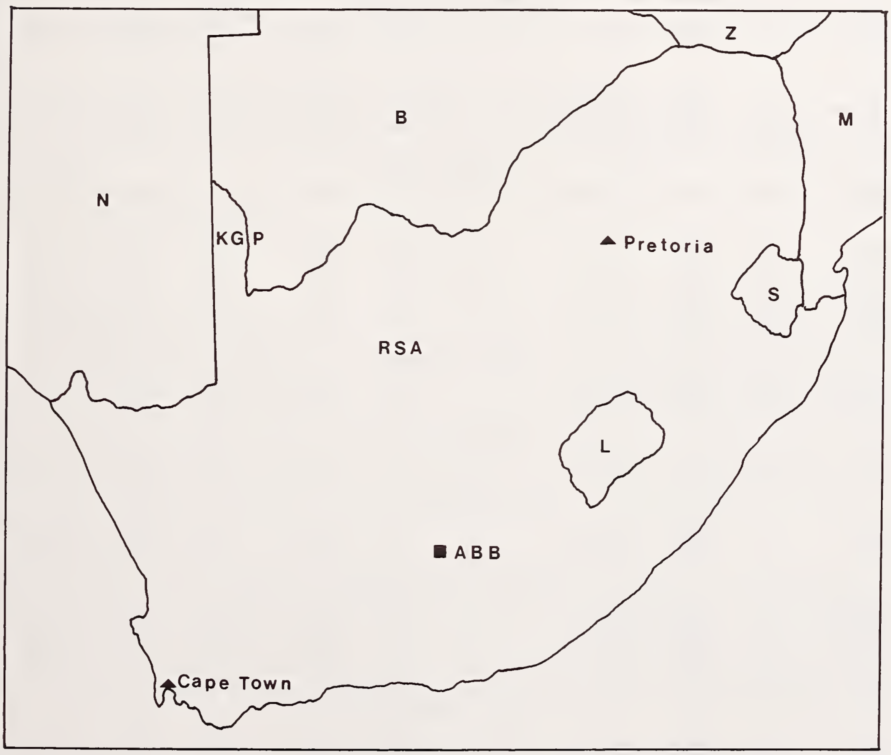
Early historical records of the 18th century only make passing reference to the wild animals in the valley. However, in his diary, Jacob Gordon (Raper and Boucher 1988) mentions that small herds of springbok remained in the valley for most of the year, but that larger herds (not mega-herds) moved in from September to November, migrating southwards. He observed that most lambs were dropped in August and September (Raper and Boucher 1988). Mating must therefore have taken place at the end of the rainy season in late summer and autumn, when ewes would have been in optimum condition.

The heavily fragmented ABB macrofaunal sample consists of over 142 000 fragments of which 6.6 % could be identified, representing 46 different species. Of the 9415 identified fragments 4586 (49 %) are from springbok and 1418 (15 %) from probably springbok. Determinations were made by using the comparative skeletal collections of the Transvaal Museum and the osteomorphological criteria for fragments of springbok (Plug and Peters 1991) and for modern springbok skeletons (Peters and Brink 1992).

Measurements were taken with dial calipers to the nearest 0.1 mm. Only bones from fully adult animals were measured according to procedures defined by von den Driesch (1976) and Peters (1988). Means and standard deviations were calculated. Only 337 post-cranial springbok fragments were measurable, including complete as well as partially complete bones, mostly carpals, tarsals and phalanges.

The measurements of modern springbok adults of known sex (Peters and Brink 1992) were compared to those of the archaeological sample. The table lists the measurements of the archaeological post-cranial elements that number five or more, as well as the relevant measurements of modern springbok.

No detail information exists on the ages of springbok in relation to skeletal development. Based on



Map of southern Africa showing the position of Abbot's Cave (ABB). N = Namibia; B = Botswana; Z = Zimbabwe; M = Mozambique; RSA = Republic of South Africa; L = Lesotho; S = Swaziland; KPG = Kalahari Gemsbok Park

Table. **The measurements of postcranial skeletal elements of archaeological and modern springbok where sample size is five or more**

The measurements of the modern springbok are taken from Peters and Brink (1992)

	Archaeological sample			Modern females			Modern males		
	n	x	s	n	x	s	n	x	s
				Os carpi radiale					
GD	26	20.0	1.24	26	19.7	1.21	20	21.1	1.46
GH	26	12.6	1.55	26	13.4	1.00	20	14.3	1.17
BFd	26	10.8	1.52	26	9.9	0.64	20	10.7	0.93
				Os carpi intermedium					
GD	9	19.6	0.60	25	19.0	1.32	18	20.4	1.36
GH	9	12.8	0.83	25	12.7	1.09	18	13.7	1.11
				Os carpi ulnare					
GL	16	18.4	1.15	26	18.4	1.06	18	20.1	1.33
				Os carpale II + III					
GB	31	14.0	1.93	25	14.6	0.96	19	15.7	1.13
GD	31	15.1	2.36	25	15.9	0.96	19	16.9	1.32
				Os carpale IV					
BFd	42	10.4	0.62	25	10.4	0.73	18	10.8	2.66
GH	42	11.1	0.86	25	10.9	0.89	18	11.1	2.67
				Os metacarpale III + IV					
Bd	5	23.5	1.35	26	22.4	1.43	19	20.5	1.60
Dd	5	18.5	0.62	26	18.0	1.32	19	24.3	1.08
				Patella					
GL	5	26.4	2.40	26	28.5	2.15	20	30.0	2.21
GB	5	22.3	4.29	26	25.1	2.05	20	26.1	3.35
				Os malleolare					
GD	30	15.0	1.01	23	15.4	1.16	19	16.0	1.25
				Talus					
GLl	30	29.9	1.73	29	30.5	1.98	20	31.7	2.53
GLm	30	27.6	1.36	29	28.7	1.82	20	29.5	2.08
Dl	30	17.2	0.86	29	17.6	1.10	20	18.3	1.48
Bd	30	18.5	1.17	29	18.9	1.22	20	19.6	1.43
				Os centroquartale					
GB	5	24.3	0.79	27	24.3	1.57	20	25.5	1.71
GD	5	23.1	1.11	27	26.1	1.61	20	27.6	1.99
				Os tarsale II + III					
GD	28	17.9	1.28	24	17.7	1.52	20	18.5	1.97
				Os metatarsale III + IV					
Bd	7	24.6	0.63	26	23.4	1.43	19	25.2	1.57
Dd	7	18.6	0.56	26	18.5	1.63	19	19.7	0.98
				Phalanx proximalis pedis					
GLpe	6	40.6	3.07	25	43.4	2.89	19	46.1	4.10
BP	6	11.6	0.57	25	11.9	0.78	19	12.3	0.89
Bd	6	10.6	0.28	25	10.1	0.79	19	10.6	0.80
SD	6	9.0	0.33	25	8.8	0.78	19	9.3	0.75
				Phalanx media manus					
GL	7	25.4	0.74	23	25.5	1.72	19	27.2	2.51
BP	7	10.3	0.56	23	10.1	0.64	19	10.9	0.89
Bd	7	8.7	0.64	23	8.6	0.63	19	9.2	0.67
SD	7	7.6	0.62	23	7.1	0.51	19	7.7	0.61

Table (continued)

	Archaeological sample			Modern females			Modern males		
	n	x	s	n	x	s	n	x	s
				Phalanx media pedis					
GL	7	23.6	0.39	24	25.0	1.68	19	26.3	2.23
BP	7	10.3	0.29	24	10.1	0.70	19	11.0	2.03
Bd	7	8.9	0.47	24	8.6	0.73	19	9.0	0.61
SD	7	7.5	0.38	24	7.2	0.55	19	7.6	0.71
				Phalanx distalis					
DLS	72	27.7	1.94	20	30.2	3.21	18	33.0	3.99
Ld	72	23.4	1.81	20	25.4	2.94	18	28.2	3.76
Hp	67	17.0	1.69	20	17.5	1.40	18	19.0	1.35
BFp	72	8.6	0.70	20	8.4	0.68	18	8.8	0.62

n = number; x = mean; s = standard.

tooth eruption, tooth wear and epiphyseal fusion the following relative age categories, with brief descriptions, are distinguished (Plug 1988, 1993):
Foetal/neonate: deciduous teeth unerupted, unfused proximal radius, os centroquartale and metapodials (longitudinally, proximally and distally), bones spongy;
Neonate/juvenile: deciduous teeth erupting/just in wear, M 1 unerupted/erupting, proximal radius, os centroquartale and metapodials longitudinally still unfused or beginning to fuse;
Juvenile: deciduous teeth and M 1 in wear, M 2 erupting, metapodials longitudinally fused, most epiphyses unfused, articulation surfaces well defined;
Sub-adult: M 2 in wear, M 3 erupting, heavy wear on deciduous teeth, most epiphyses beginning to fuse;
Young adult: M 3 in wear, most deciduous teeth replaced, most epiphyses fused;
Adult: all permanent teeth present and in wear, heavy wear on M 1, all epiphyses strongly fused;
Mature: heavy wear on all teeth, no central islands on M 1 and disappearing on M 2 and M 3;
Aged: no central islands on M 3, M 1 and M 2 worn down to roots, ossification of muscle attachments and cartilage.

Pelvis fragments were used to determine the sex of adult individuals. No other bones were well enough preserved to allow sexing.

Results

The springbok bone sample contains an unprecedented amount, almost 15 %, of foetal/neonate bones and an additional 2 % neonate/juvenile bones. This is the first time that so many bones from such young (nondomestic) animals have been found in a South African archaeological site. Foetal animals are seldom represented and neonates only occasionally, but juveniles are usually well-represented in most assemblages. As foetal and neonate bones are extremely fragile, they may even be underrepresented in the ABB sample. The other age categories represented are: 1 % sub-adult, less than 1 % young adult, 75 % adult, 4 % mature, and 2 % aged. There were no juveniles present in the sample.

The measurements of the archaeological sample fall mainly within the range of those of modern females (Tab.). Some of the archaeological bone, phalanges in particular, are somewhat smaller on average, than modern females, but the differences are small and not consistent. Of the 40 pairs of mean values, the mean of the archaeological measurements is smaller than the modern mean of females in 19 cases, larger in 18 cases and equal in three. Compared to modern males, the archaeological sample is smaller in 36 cases, larger in one and equal in three.

The standard deviations of the measurements of the archaeological sample were also compared with those of the modern sample. This shows that in 26 and 30 of the measurements the archaeological sample has a smaller standard deviation and in 14 and 10 a larger standard deviation than the modern female and male samples respectively. This indicates that the animals from the ABB herds were slightly more homogenous in size than those of the modern sample. This result is not unexpected as the modern sample consists of animals that were obtained from different geographical regions.

Osteomorphologically it was not possible to distinguish with confidence between the sexes, as attempts to determine sex were hampered by the fragmented nature of the assemblage. Subsequently only eight females and two males were identified on pelvis fragments, but as male pelves are more robust than those of females and are less susceptible to natural attrition, females are probably underrepresented. The possibility that there is overlap between young males and large females should be considered. The young adult category is poorly represented ruling out the possibility that young males (or young females) influenced the sample significantly. It can therefore be argued that, combined with the high incidence of foetal/neonates, the majority of the adult springbok were females.

Discussion

Archaeological faunal samples have inherent limitations for research, related to fragmentation, preservation and attrition. Nevertheless, the results show that even samples as heavily fragmented as the ABB assemblage, have research value.

The age structure of the springbok from ABB suggests that the majority of the animals did not come from mixed herds or migrating mega-herds. Foetal/neonate animals are not part of the former and can be expected in small numbers only, in the latter, whereas the juvenile, sub-adult and young adult categories should be better represented in both herd types.

The results indicate that females were more frequently hunted than males, while the large foetal/neonate component shows that they were culled from female lambing herds. The hunters of ABB appear to have been familiar with the migratory and breeding cycle of the springbok and deliberately preyed on pregnant and lactating females as these would have had a relatively high body fat content.

The ABB deposits give no indication of major climate changes within the past 1000 years (Bousman 1991). It would therefore be reasonable to assume that the prime mating season for springbok was in late summer and autumn when grazing in this region is at its best after the summer rains. As a result the majority of foetal and neonate springbok from ABB would have been born in August–September, as has been observed in the 18th century.

The age categories of the springbok from ABB indicate that the herds did not remain in the vicinity long after lambing. Juvenile, sub-adult and young adult animals are either absent or poorly represented, suggesting that the new crop of lambs matured elsewhere. The area near ABB would have been attractive to springbok in August–September, as it has a small seasonal wetland that could have supported some good grazing towards the end of winter.

In summary, the springbok living in the Seacow Valley before settled farming, usually dropped their lambs in early spring (August to September). They congregated in female herds for the occasion, but did not remain in the area. The herds seem to have had some mobility, probably on regional scale, to optimize grazing opportunities.

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Zusammenfassung

Springböcke, Antidorcas marsupialis (Zimmerman, 1780), aus vergangenen Zeiten

Die Entdeckung einiger tausend Springbockknochen (*Antidorcas marsupialis* Zimmerman, 1780) von einer archäologischen Fundstelle in der Karoo, Südafrika (13.–17. Jahrhundert), bot die Gelegenheit, Populationsstruktur, Körpergröße und saisonale Fluktuationen der Art zu untersuchen, bevor Farmgründungen und starke Bejagung das Wanderverhalten störten und die Bestände reduzierten. Die ausgegrabenen Knochen stammen überwiegend von ungeborenen und ganz jungen Individuen und von ausgewachsenen Weibchen. Osteometrische Vergleiche mit rezenten Springbockweibchen zeigten, daß die damaligen Tiere im Durchschnitt etwas kleiner waren. Das Vorkommen zahlreicher Feten und Jungtiere macht es wahrscheinlich, daß die Herden das Gebiet und die Fundstelle im Frühjahr und zum Sommeranfang aufsuchten und hier dann gejagt wurden.

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Author's address: Ina Plug, Department of Archaeozoology, Transvaal Museum, P. O. Box 413, Pretoria 0001, South Africa