

A PRELIMINARY REPORT ON THE LARGER MAMMALS FROM THE BOOMPLAAS STONE AGE CAVE SITE, CANGO VALLEY, OUDTSHOORN DISTRICT, SOUTH AFRICA*

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Introduction

The Boomplaas Stone Age Cave site (33°32'S, 22°11'E) is located in the Cango River valley, roughly 40 km north of Oudtshoorn and only 4-5 km from the well-known Cango Caves. H. J. Deacon initiated excavation of the site in January 1974 and has directed several seasons there since. Excavation and analysis of excavated materials will continue for several years to come.

Deacon's excavations have shown that the site contains 5 m of stratified deposits, including a minimum of thirty-nine lithologically distinct layers divided among seven successive Stone Age culture-stratigraphic units (H. J. Deacon & Brooker 1976; H. J. Deacon *et al.* 1976; H. J. Deacon, pers. comm.). These are (from top to bottom): 'Herder', Wilton, Albany, Robberg, and three earlier units which have so far not received formal cultural designations. I have referred to these three units here as 'Earlier Upper

Pleistocene (EUP)' units 3, 2 and 1, from younger to older. So far, sixteen ¹⁴C (charcoal) samples have been processed [at the University of Washington in Seattle (Fairhall *et al.* 1976; Fairhall, pers. comm.) and at the National Physical Research Laboratory C.S.I.R. in Pretoria (Vogel, pers. comm.)]. These indicate that the 'Herder' unit dates to between 1700 and 1500 B.P. The latest of the underlying Wilton occupations is roughly 2 000 years old, while earlier Wilton peoples had definitely occupied the site by 6400 B.P. The Albany occupation began sometime before 10 400 years and ended after 9 100 years ago. On the basis of information from other sites, the Albany industry probably spanned the interval between 12 000 and 8000 B.P. (J. Deacon 1978). Dates on the top of the underlying Robberg occupation at Boomplaas indicate it terminated about 12 000 B.P. The age of the earliest Robberg at the site remains to be established, but 'Earlier Upper Pleistocene Unit 3' was still present 21 100 years ago. It extends back to > 40 000 years. The underlying 'Earlier Upper

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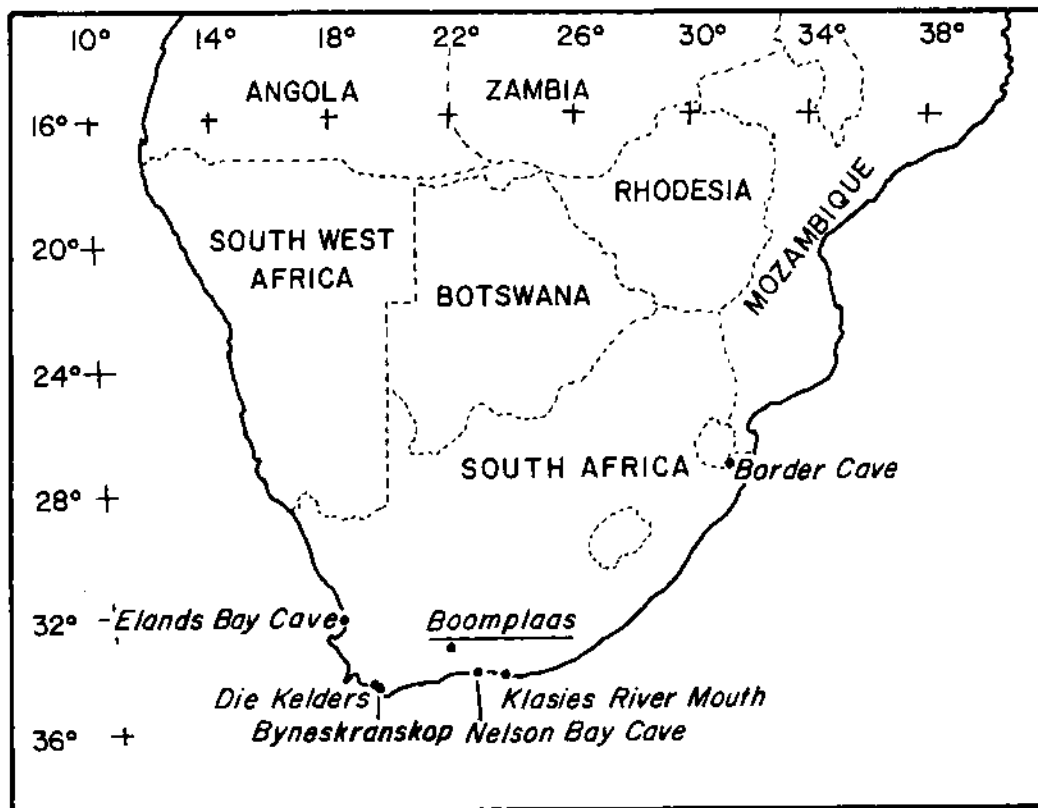


Fig. 1. The approximate locations of sites mentioned in the text.

Pleistocene Units' 2 and 1 are also both older than 40 000 years, probably by a substantial amount. In sum, it is clear that the Boomplaas sedimentary sequence spans most of the Upper Pleistocene and Holocene, with no more than minor breaks. Particularly noteworthy are the deposits with an apparent age between 40 000 and 20 000 B.P. Boomplaas is the first southern Cape site, and indeed one of no more than three or four known sites in southern Africa to contain archaeological deposits demonstrably in this time range.

In addition to stone artefacts, all the layers at Boomplaas have provided bones. These are broadly divisible between larger ones that represent the 'kitchen debris' of the Stone Age occupants and microbones (mainly from small rodents and insectivores) that were probably introduced by owls. There is a clear tendency for levels that are rich in microfaunal remains to alternate with ones that are rich in artefacts and larger bones, indicating that owls used the site most intensively when people were absent. The microfaunal bones are being studied by D. M. Avery, while I am analysing the larger bones. This paper constitutes a preliminary report of my results, with emphasis on the Wilton and 'Herder' levels which have been the principal object of excavation and analysis so far.

Sorting, Counting, and Identification

I sorted the Boomplaas bones in the Department of Cenozoic Palaeontology at the South African Museum (Cape Town). The bones are highly fragmented, mostly as a result of post-depositional crushing, burning, and leaching, and most pieces are in fact small fragments that I cannot identify to either body part or taxon. I sorted the minority that are 'identifiable' as finely as possible, where practical dividing body parts of a taxon between lefts and rights and between ones with fused and unfused epiphyses. I then added the larger number, left or right, with epiphyses fused, to the larger number, left or right, with epiphyses unfused to obtain the minimum number of individuals represented by that body part (e.g. by the distal humerus or the proximal femur). Excepting atlases and axes which I counted separately, I sorted vertebrae of a taxon into gross categories (cervicals 3-7, thoracics, lumbar, and sacral), and divided the number in a category by the number present in a single living individual to obtain a rough estimate of the minimum number of individuals represented by that category. I proceeded in a similar way for phalanges, where practical sorting them into lefts and rights, firsts, seconds, and thirds, and then dividing the sum for a category by a number appropriate for the category and taxon.

As in most of the southern African archaeological bone assemblages I have studied, teeth at Boomplaas occur mainly as isolated examples rather than in jaws with other teeth. In order to obtain an estimate of the minimum number of individuals of a taxon represented by teeth, I therefore recorded both position in the mouth and degree of wear. This allowed me to reconstruct the 'mouths' from which teeth were derived, providing not only an overall minimum numbers estimate for a species, but also

a rough idea of the numbers of individuals in different age classes at time of death. (Table 3 presents the results for the Boomplaas bovids.) Since judgement of the amount of wear must remain largely subjective, the age distributions I have established are not precise, but I believe they are reasonable compared among themselves or to age distributions that have been similarly constructed for other sites.

Finally, after I established the minimum numbers of individuals of each species represented by different body parts (both cranial and postcranial), I selected the largest number as the minimum number of individuals by which the species in general was represented. I did this on a layer-by-layer basis. The result is presented in Table 1.

I found it difficult to separate some closely related species on the basis of the available materials and, therefore, some of the categories in Table 1 are composite. This particularly pertains to the bovids, whose teeth I could generally identify to species, but whose fragmentary postcranial remains I was forced to assign to four broad size categories—small, small medium, large medium, and large, as defined in the caption to Table 1. Even with teeth, I was not always certain of my ability to distinguish hartebeest (*Alcelaphus buselaphus*) from black wildebeest (*Connochaetes gnou*), blue antelope (*Hippotragus leucophaeus*) from roan (*H. equinus*), or mountain zebra (*Equus zebra*) from quagga (*E. quagga*), all of which were probably present in the vicinity of the site at one time or another during the period of Stone Age occupation. There were a handful of nearly complete *Raphicerus* mandibles which I could identify as either grysbok (*R. melanotis*) or steenbok (*R. campestris*), but the majority of specimens were isolated teeth which I could assign only to *Raphicerus* sp. Both the bushpig (*Potamochoerus porcus*) and the warthog (*Phacochoerus aethiopicus*) are represented by teeth, but most of the suid bones I found were fragmentary postcranial remains which I could assign only to a generalized suid category. Finally, it is clear that there are at least two species of hare present. One is probably the Cape hare, *Lepus capensis*, and the other possibly Crawshay's hare, *Lepus crawshayi*. However pending the acquisition of pertinent comparative material, I have lumped them for presentation here.

Palaeoenvironmental Implications of the Boomplaas Fauna

At least historically, the vegetation of the Congo valley consisted primarily of bush and dense scrub (Moffett & Deacon 1977), in which the principal larger mammals were probably rock hyrax, baboon, and small and small medium antelopes, particularly grysbok/steenbok, klipspringer, vaalribbok, and mountain reedbeek. Close examination of Table 1 will show that these are the principal larger mammal species represented in the Boomplaas Wilton levels (BLD 3-BFBL). However, they are less common in the underlying Albany horizons (BRL-BRL 7YA) and they are especially infrequent in the Robberg (BRL 7Y-GWA TBF) and 'EUP 3' horizons (GWA GGU-OLP). This point is brought out more clearly in Table 2 where the composite frequency of mountain

reedbuck, vaalribbok, klipspringer, and grysbok/steenbok is compared to that of the principal larger grazing ungulates (equids and alcelaphine antelopes) in the various Boomplaas culture-stratigraphic units. The large grazers are relatively more common in the Albany and especially in the Robberg-'EUP 3' layers. A comparably high frequency of large grazers also characterizes immediately 'Pre-Wilton' layers in every other relevant southern Cape fauna that has been examined (Klein 1974a, 1975, 1977a). The most economical explanation is that the regional vegetation during Albany and especially during Robberg-'EUP 3' times included substantially more grassland than the historic or Wilton vegetation. Differences in vegetation were to be expected in so far as both average temperature and atmospheric circulation patterns during Albany and especially Robberg-'EUP 3' (Last Glacial) times were probably significantly different from the patterns that pertained in Wilton (Present Interglacial) times. In this context, it is interesting to note that the composite frequencies presented in Table 2 suggest that the Albany levels are faunistically intermediate between the Robberg and Wilton ones. The same phenomenon has been observed at Nelson Bay Cave (Klein 1972) and presumably reflects the fact that the Albany Industry spans the period of transition between the Last Glacial and the Present Interglacial (from roughly 12 000 to 8000 B.P.).

Although the available samples are small from the levels belonging to 'Earlier Upper Pleistocene Units' 2 and 1, Table 2 suggests that during at least part of the time interval involved the vegetational mosaic was broadly comparable to the historic one. This suggests that the bottom of the Boomplaas sequence perhaps dates from the Last Interglacial. The larger samples that will come from future excavations will permit a check on this idea, and also possibly allow comparisons directly among individual layers, rather than culture-stratigraphic units. This may show that the pattern of environmental change, as reflected in the fauna, was more complex than the picture that emerges from comparisons among cultural units as presented in Table 2.

Subsistence Implications of the Boomplaas Fauna

The long-term fluctuations in the frequencies of different game animals near Boomplaas undoubtedly led to important changes in the subsistence strategy of its inhabitants, certainly affecting, for example, the timing of their seasonal round, the size of the territory they traversed in a year, and the extent to which they relied on plants and other collectable resources (cf. Deacon, H. J. 1976; 159 ff.). It is possible that enlargement of the faunal samples from the lower part of the sequence will show that there were culturally determined differences in subsistence between earlier and later Upper Pleistocene peoples, similar to the differences I have hypothesized from comparisons between relevant faunas from other southern Cape sites (Klein 1974a, 1975, 1977a). For the moment, Boomplaas clearly records at least one major subsistence change that was culturally initiated—the introduction of domestic sheep at least as early as 1700 B.P.

Sheep remains as early or even two to three centuries earlier than those at Boomplaas are also known locally from Die Kelders (Schweitzer & Scott 1973; Schweitzer 1974, 1976) and from Nelson Bay Cave (Klein & Inskeep unpublished). The Nelson Bay sheep remains are meagre and highly fragmented, but the Die Kelders sample is relatively large and includes a number of complete or nearly complete jaws, as well as some frontlets from which sex can be determined. My examination of the Die Kelders sample suggested that the majority of individuals were probably young males, with a scattering of old females and very little else. Schweitzer (1974) interpreted this as evidence that the Die Kelders people were selectively culling a flock and thus that they were herders rather than thieves. That the Boomplaas people were also herders is suggested by the fact that the matrix enclosing sheep bones is largely calcined sheep dung. This means that the human inhabitants were kraaling sheep in the cave. The Boomplaas bones are too fragmented to establish a reliable sex ratio, and the dental age distribution (Table 3) must be regarded cautiously. It shows a preponderance of older animals, but there is a good possibility that jaws and teeth of younger animals were disproportionately destroyed by the intense heat to which all bones in the burnt dung matrix were subjected. In this context, it is pertinent that most of the probable sheep postcranial material in the 'Herder' levels comes from very young animals. Under conditions of intense heat, postcranial bones would be expected to survive better than teeth (see below). Furthermore, the underlying Wilton horizons, which were less affected by intense heat than the 'Herder' ones, contain a higher proportion of young bovid dentitions (from indigenous species—see Table 3). In sum, there is good reason to suppose that there were originally many more young sheep jaws in the 'Herder' horizons than appear in Table 3. The original age distribution may in fact have resembled the Die Kelders one (Table 4).

Examination of Table 1 will show that there is a single sheep in the uppermost Wilton horizon (BLD3). Assuming that the single upper dentition involved is not intrusive, this may mean that the last Wilton peoples to occupy the site were in fact in contact with sheep herders. Whatever the case, it is interesting that the Wilton layers are distinctly richer in wild creatures than the 'Herder' horizons. Some species represented in the Wilton levels do not occur in the 'Herder' ones at all. I have observed the same phenomenon at Nelson Bay and Die Kelders. It suggests either that herders did less hunting overall or that they were more opportunistic about it, perhaps taking only those creatures which occurred in the immediate vicinity of the site.

Body Part Frequencies in the Boomplaas Fauna

Tables 5 and 6 present body part frequencies for the bovids and other animals in the Wilton and 'Herder' levels of Boomplaas. I shall present and discuss comparable data from the pre-Wilton levels in future papers.

As is true in virtually all bone accumulations, Tables 5 and 6 show that some body parts in the Boomplaas assemblages are substantially better repre-

sented than others. The factors that have produced this situation may be briefly illustrated with the bovid data. The small and small medium bovids tend to be reasonably well represented by a wide variety of their body parts, while the large and large medium ones are represented almost exclusively by bones of the foot and head. Although the Boomplaas samples are too small to demonstrate statistical significance for the contrast, the pattern is basically the same as in all other southern African archaeological faunas I have studied; for example, those from Klasies River Mouth (Klein 1976) and Border Cave (Klein 1977b). This suggests that like other southern African Stone Age peoples, the Wilton and 'Herder' inhabitants of Boomplaas tended to bring the bodies of smaller bovids to the site intact (the sheep were probably already there), while they butchered larger ones where they were killed and carried home only selected parts (mainly foot and cranial bones).

As at other sites, besides differential transport back to the site, the second factor that played an important role in producing Boomplaas body part frequencies was differential bone durability. Brain (1967, 1969) has pointed out that greater density and an earlier time of epiphyseal fusion render bovid distal humeri more durable than proximal ones, proximal radii more durable than distal ones, proximal femora more durable than distal ones, and distal tibiae more durable than proximal ones. Examination of Table 5 will show that the opposite ends of the respective long bones indeed display the frequency discrepancies that would be expected from their known durability characteristics.

Under most circumstances, teeth are more durable than virtually all postcranial elements, and in all the other archaeological faunas I have examined, teeth have provided the highest minimum numbers estimates for bovids. Table 5 shows that Boomplaas does not conform to this generalization. Various postcranial parts are well represented relative to teeth and provide minimum individual counts that are as high or higher than those provided by teeth. While sampling error (small sample size) may be responsible in the case of the large medium and large bovids, it is much less likely to be so for the small and small medium ones, the sample sizes of which are comparable to those in the other archaeological faunas I have studied. The relatively high frequency of various small and small medium bovid postcranial elements is particularly clear in the 'Herder' levels (see Table 7), which suggests an explanation. The bones in the 'Herder' levels and to a lesser extent in the immediately underlying Wilton ones were subjected to intense heat from the smouldering combustion of the sheep dung matrix of the 'Herder' levels. Teeth, which are made up of several substances, tended to shatter into unidentifiable fragments, while postcranial bones remained identifiable, although often incredibly deformed. This gave rise to a tooth to postcranial ratio which is uniquely low in my experience.

Extinct Species in the Boomplaas Fauna

Several of the species listed in Table 1 are extinct, namely the 'giant Cape horse' (*Equus capensis*), the blue antelope (*Hippotragus leucophaeus*), the 'giant

hartebeest' (*Megalotragus priscus*), and the giant buffalo (*Pelorovis antiquus*). It is possible that some isolated teeth of bastard hartebeest and springbok also derive from extinct species (*Damaliscus niro* and *Antidorcas australis* respectively), but they may equally well derive from the extant blesbok/bontebok (*Damaliscus dorcas*) and springbok (*Antidorcas marsupialis*). Some alcelaphine teeth which are too large for red hartebeest/black wildebeest (*Alcelaphus buselaphus/Connochaetes gnou*) and too small for 'giant hartebeest' may also represent an extinct taxon, but it is just conceivable they belong to the blue wildebeest (*Connochaetes taurinus*), though Boomplaas is far outside its historic range. I hope to resolve this problem through more detailed study, incorporating the larger samples that will be available in the near future from enlarged excavations.

With the exception of the blue antelope, which became extinct in historic times (Mohr 1967; Klein 1974b), none of the extinct or potentially extinct species represented at Boomplaas has been found in any deposit postdating 10 000 B.P. The chronostratigraphic provenience of bones of extinct taxa at Boomplaas strengthens the argument made on the basis of material from Nelson Bay (Klein 1972, 1974c), Elands Bay (Klein 1974c and unpublished; Parkington 1978), and Byneskranskop (Klein in press) that the extinctions took place in the terminal Pleistocene, roughly 12 000–10 000 years ago. I have discussed the probable reasons for extinction elsewhere (Klein 1974c, 1975, 1977) and plan to readdress the question in further reports on the Boomplaas fauna in which the Pleistocene levels will be emphasized.

Summary

Analysis of the Boomplaas fauna so far suggests the following conclusions:

(1) Large grazing ungulates were substantially more common in the late Pleistocene environment of the site than in the Holocene one. In combination with similar evidence from other southern Cape sites, this suggests that the late Pleistocene (Last Glacial) vegetation contained significantly more grassveld than the Holocene one. The frequency of large grazers in the fauna from the base of the sequence is similar to that in the Holocene levels, suggesting that the base may in fact date from the Last Interglacial.

(2) Domestic sheep appeared at the site at least 1 700 years ago. A high degree of bone fragmentation and the probably differential destruction of the jaws of younger animals by intense heat in the deposit make it impossible to establish the age and sex characteristics of the fossil flock, but the fact that the matrix in the sheep levels is calcined sheep dung indicates the site was used as a kraal. This suggests that the human occupants were probably active sheep herders and not simply sheep thieves. The relatively low frequency of wild creatures in the sheep levels, also observed at other sites, suggests the herders did relatively little hunting while at the site.

(3) Study of the body part frequencies so far indicates that the Wilton and especially the 'Herder' levels at Boomplaas are unusual in the relatively low frequency of jaws (teeth) versus postcranial remains. This is almost certainly a result of the comparatively

intense heat to which the Wilton and especially the 'Herder' bones were subjected when the dung matrix of the 'Herder' levels was burnt.

(4) As at other southern Cape sites, the stratigraphic provenience of extinct species in the Boomplaas deposits suggests there was a major episode of large mammal extinctions in the terminal Pleistocene, roughly 12 000-10 000 B.P.

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TABLE 1. The minimum numbers of individuals by which various mammalian species are represented in the various levels of Boomplaas Cave. In the context of the table, small bovids include klipspringer, grysbok and steenbok; small medium ones mountain reedbuck, springbok, vaalribbok and sheep; large medium ones kudu, blue antelope/roan, southern reedbuck, hartebeest/wildebeest and indeterminate large alcelaphine; and large ones 'giant hartebeest', Cape buffalo, giant buffalo and eland.

	'Herder' Levels						Wilton Levels						Albany Levels									
	DGL	DGL	DGL	BLD	BLD	BLD	BLD	BLD	BLD	BLD	BLD	BLD	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Leontidae gen. et sp. indet. (2 spp.) hares	1	2	3	4	1	1	2	2	2	2	2	3	4	3	4	5	6	7	8	9	10	11
<i>Hystrix africae-astralis</i> , porcupine	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Hippopotamus</i> , bawoan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Capra</i> spp., people	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Equus</i> cf. <i>mesomelas</i> , jackal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Mastomys capensis</i> , honey badger	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Geneta</i> sp., genet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Hesperetes fitzingeri</i> , Egyptian mongoose	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Hesperetes pulchellus</i> , Cape grey mongoose	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Hyaena</i> spp., hyena	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Felis</i> cf. <i>caucasi</i> , probable cat	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Protonia pardus</i> , leopard	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Protonia capensis</i> , rock hyrax	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Loxodonta affinis</i> , elephant	2	8	1	2	2	1	2	1	1	1	1	5	21	18	5	1	5	3	3	1	1	1
<i>Equus zebra</i> or <i>E. quagga</i> , mountain zebra or quagga	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Equus caballus</i> , giant Cape horse	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rhinocerotidae gen. et sp. indet. (? <i>Diceros bicornis</i>)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Paranoceros</i> , porcus, bushpig	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Phacochorus</i> , wartpig	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Suidae</i> - general	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Taurotragus oryx</i> , eland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Taurotragus oryx</i> , greater kudu	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Hippotragus</i> spp., blue antelope/roan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Redunca arundinum</i> , southern reedbuck	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Redunca subaenulata</i> , mountain reedbuck	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Alcelaphus buselaphus</i> (<i>Connochaetes gnou</i>), red hartebeest/black wildebeest	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Damaliscus dorcas</i> or <i>D. nitro</i> , bastard hartebeest	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Alcelaphini</i> gen. et sp. indet., large indeterminate alcelaphine antelope	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Megalotragus priscus</i> , 'giant hartebeest'	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Antidorcas</i> (<i>Antidorcas</i>) sp., springbok	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Pelea capreolus</i> , vaalribbok	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Oreotragus oreotragus</i> , klipspringer	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Raphiterus</i> spp., grysbok/steenbok	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Syncerus caffer</i> , Cape buffalo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Peleotragus antiquus</i> , giant buffalo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Ovis arcticus</i> , sheep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bovidae - general	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
small	8	4	2	2	6	1	3	1	3	4	8	7	4	1	1	1	1	1	1	1	1	1
small medium	6	2	2	2	5	2	3	2	2	2	4	5	2	1	1	1	1	1	1	1	1	1
large medium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
large	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 1 (continued)

	Robberg Levels			Easier Upper Pleistocene 3' Levels				E.U.P. 2			E.U.P. 1 Levels					
	BR	CL	CL	GW	WA	LP	LPM	LFC	LPC	LFC	YOL	BP	OLF	BOL	OCH	LOH
	7Y	2	1	3/4	TRF	GGU	CF	YS	3							
<i>Leporidae</i> gen. et sp. indet., (2 spp.), hares																
<i>Hystrix africaeast-australis</i> , porcupine																
<i>Papio ursinus</i> , baboon																
<i>Homo sapiens</i> , pebble																
<i>Canis cf. mesonelas</i> , jackal																
<i>Mellivora capensis</i> , honey badger																
<i>Gemetra</i> sp., genet																
<i>Herpestes ichniumph</i> , Egyptian mongoose																
<i>Herpestes pulverulentus</i> , Cape grey mongoose																
<i>Hyena brunnea</i> , brown hyena																
<i>Felis libyca</i> , wildcat																
<i>Felis cf. caracal</i> , probable caracal																
<i>Panthera pardus</i> , leopard																
<i>Procapra capensis</i> , rock hyrax																
<i>Loxodonta africana</i> , elephant																
<i>Equus zebra</i> or <i>E. quagga</i> , mountain zebra or quagga																
<i>Equus capensis</i> , 'giant Cape horse'																
Rhinocerotidae gen. et sp. indet. (? <i>Diceros bicornis</i>), rhinoceros																
<i>Potamochoerus porcus</i> , bushpig																
<i>Phacochoerus zerkloptus</i> , warthog																
Suidae - General																
<i>Taurotragus oryx</i> , eland																
<i>Tragelaphus streptoceros</i> , greater kudu																
<i>Hippotragus</i> spp., blue antelope/roan																
<i>Kedurus arundinaria</i> , southern reedbuck																
<i>Redunca fulvorufa</i> , mountain reedbuck																
<i>Alcelaphus buselaphus</i> , Conchaetes gnora, red hartebeest/black wildebeest																
<i>Damaeus dorcas</i> or <i>D. niro</i> , bastard hartebeest																
Alcelaphini gen. et sp. indet., large indeterminate acetalpine antelope																
<i>Megalotragus petersi</i> , 'giant hartebeest'																
<i>Antidorcas (Antidorcas) sp.</i> , giant springbok																
<i>Pelea capreolus</i> , saabiibok																
<i>Oreotragus oreotragus</i> , klippspringer																
<i>Raphicerus</i> spp., rhybok/steenbok																
<i>Syncerus caffer</i> , Cape buffalo																
<i>Pelorovia lambeus</i> , Giant buffalo																
<i>OVIS aries</i> , sheep																
Bovinae - general																
small																
medium																
large																
large																

TABLE 2. The minimum numbers of mountain reedbuck, vaalribbok, klipspringer, and grysbok/steenbok versus those of equids and alcelaphines in the various culture-stratigraphic units of Boomplaas Cave (data extracted from Table 1). Note that the probabilities listed for chi-square values are all two-tailed. From evidence obtained earlier at other southern Cape sites, the Boomplaas Albany horizons would be expected to contain not just a *different* proportion of equids and alcelaphines than the Wilton ones, but a *higher* proportion, as they obviously do. This means that a one tailed probability figure may be attached to the relevant chi-square value. The one tailed probability is 0,5-0,25, making the difference between the Wilton and Albany levels in the proportion of equids and alcelaphines statistically significant by widely agreed-upon convention.

	WILTON	ALBANY	ROBBERG	EARLIER UPPER		
				PLEISTOCENE 3	E.U.P. 2	E.U.P. 1
mountain reedbuck, vaalribbok, klipspringer and grysbok/steenbok	38 (81 %)	62 (65 %)	17 (22 %)	6 (14 %)	5 (83 %)	6 (86 %)
equids and alcelaphines	9	33	59	38	1	1

Selected chi-square values

	chi-square	p (two-tailed)
Wilton vs. Albany	3,65	,10-.05
Wilton vs. Robberg	40,14	,001
Wilton vs. 'EUP 3'	41,04	,001
Albany vs. Robberg	31,22	,001
Albany vs. 'EUP 3'	32,01	,001
Robberg vs. 'EUP 3'	1,33	,3-.2

TABLE 3. The minimum numbers of individual bovids in various dental age states in the 'Herder' and Wilton horizons of Boomplaas Cave. The age states are defined to include animals in which (I) dP4 was erupting to erupted, but essentially unworn; (II) M1 was erupting to erupted, but essentially unworn; (III) M2 was erupting to erupted, but essentially unworn; (IV) M3 was erupting to erupted, but essentially unworn; (V) P4 was erupting to erupted, but essentially unworn; (VI) P4 was in early to mid-wear; and (VII) P4 was in late wear. Unlike the wild bovids, sheep were probably characterized by an eruption sequence in which P4 probably erupted before M3, so that the definition for the age states of sheep have P4 and M3 transposed.

	'Herder' Levels							Total
	I	II	III	IV	V	VI	VII	
blue antelope	—	—	—	1	—	—	—	1
vaalribbok	—	—	—	1	—	—	—	1
klipspringer	—	—	—	2	1	1	—	4
grysbok/ steenbok	—	—	—	4	1	3	—	8
sheep	1	1	4	3	1	8	—	18

	Wilton Levels							Total
	I	II	III	IV	V	VI	VII	
blue antelope	—	—	—	—	1	—	—	1
mountain reed- buck	1	1	1	1	—	4	—	8
hartebeest/ wildebeest	—	—	1	—	—	2	1	4
vaalribbok	—	—	—	1	—	—	—	1
klipspringer	—	2	1	1	—	5	1	10
grysbok/ steenbok	1	1	3	2	3	5	—	15
sheep	—	—	1	—	—	—	—	1

TABLE 4. The minimum numbers of sheep in different dental age categories in the Boomplaas and Die Kelders 'Herder' levels. The dental age categories are as defined in Table 3. I have collapsed categories here so as to permit meaningful statistical comparison. Note that the lower proportion of immature animals in the Boomplaas sample is probably due to post-depositional factors, as discussed in the text.

	BOOM- PLAAS	DIE KELDERS
Age categories I-III (pro- bably sexually immature)	6 (33 %)	18 (78 %)
Age categories IV-VII (pro- bably sexually mature)	12	5
chi-square = 6.65, p = .01-.001		

TABLE 5. The minimum numbers of different-sized bovids represented by various body parts in the 'Herder' (H) and Wilton (W) levels of Boomplaas Cave. Small bovids include klipspringer, grysbok, and steenbok; small medium ones mountain reedbuck, springbok, vaalribbok, and sheep; large medium ones kudu, blue antelope/roan, southern reedbuck, hartebeest/wildebeest, and bastard hartebeest, and large ones Cape buffalo and eland.

	SMALL BOVIDS		SMALL MEDIUM BOVIDS		LARGE MEDIUM BOVIDS		LARGE BOVIDS	
	H	W	H	W	H	W	H	W
Frontlet	3	8	3	1	—	—	—	—
Occipital condyle	5	7	37	3	—	1	—	—
Maxilla	8	16	14	11	1	3	—	—
Mandible	17	13	18	8	—	4	—	1
Atlas	8	10	6	3	—	—	—	—
Axis	10	12	10	4	—	1	—	—
Other cervical vertebrae	2	4	6	3	—	—	—	—
Thoracic vertebrae	9	9	14	5	—	2	—	1
Lumbar vertebrae	5	8	5	4	—	1	—	—
Sacral vertebrae	—	2	—	—	—	—	—	—
Scapula	11	8	8	7	—	—	—	—
Humerus—proximal	11	6	1	1	—	—	—	—
—distal	21	10	10	3	—	—	—	—
Radius—proximal	13	7	9	5	—	1	—	—
—distal	14	3	9	1	—	—	—	—
Ulna—proximal	10	14	11	3	—	—	—	—
Carpals	7	6	12	4	—	2	—	—
Metacarpal—proximal	13	7	8	3	—	2	—	—
—distal	15	7	10	5	—	1	—	—
Phalanges—1st	14	16	19	13	2	6	—	2
—2nd	17	9	12	8	1	6	—	1
—3rd	6	8	9	8	—	1	—	1
Innominate	22	13	13	5	—	—	—	—
Femur—proximal	20	8	9	2	—	—	—	—
—distal	11	2	4	3	—	—	—	—
Tibia—proximal	9	5	4	3	—	—	—	—
—distal	16	8	10	2	—	—	—	—
Patella	6	2	3	2	—	—	—	—
Calcaneum	16	9	8	5	—	1	—	1
Astragalus	12	13	16	9	—	1	—	1
Naviculo-cuboid	7	6	8	3	1	—	—	—
Other tarsals	3	1	7	6	—	—	—	1
Metatarsal—proximal	14	5	8	6	—	2	—	1
—distal	4	4	4	1	1	—	—	—

TABLE 7. The ratio of small and small medium bovid jaws to postcranial elements in the 'Herder' and Wilton levels of Boomplaas Cave, calculated from the minimum number of individuals represented by jaws and the average number represented by various postcranial elements. The postcranial elements on which calculations are based are those listed in Table 5. Sacra were excluded from the calculations for the small medium bovids since they were not represented in either the 'Herder' or the Wilton levels. The data indicate that jaws are relatively better represented in the Wilton levels, almost certainly as a result of less intense postdepositional pressures. For additional discussion, see the text.

	SMALL BOVIDS		SMALL MEDIUM BOVIDS	
	'Herder Levels'	Wilton Levels	'Herder Levels'	Wilton Levels
Minimum number of individuals represented by jaws	17	16	18	11
Average number of individuals represented by various postcranial elements	10,9	7,4	8,7	4,4
Standard deviation	5,5	3,7	3,9	2,6
Number of postcranial elements involved in calculation	30	30	29	29
Minimum number of individuals represented by jaws: average number represented by postcranial elements	1,56:1	2,16:1	2,07:1	2,50:1

TABLE 6. The minimum numbers of non-bovids represented by various skeletal elements in the 'Herder' (H) and Wilton (W) levels of Boomplaas Cave.

	Hares		Porcupine		Raboon		People		Jackal		Honey Badger		Genet		Egyptian Mongoose		Grey Mongoose		Wildcat		Caracal		Leopard		Hyrax		Elephant		Zebra		Rhinceros		Pig			
	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W				
Occipital condyle																																				
Maxilla																																				
Mandibular dentition																																				
Mandibular condyle																																				
Atlas																																				
Other cervical vertebrae																																				
Thoracic vertebrae																																				
Lumbar vertebrae																																				
Sacral vertebrae																																				
Scapula																																				
Clavicle																																				
Humerus - proximal																																				
Humerus - distal																																				
Radius - proximal																																				
Radius - distal																																				
Ulna - proximal																																				
Ulna - distal																																				
Carpals																																				
Metapodials - proximal																																				
Metapodials - distal																																				
Phalanges																																				
Interphalangeals																																				
Femur - proximal																																				
Femur - distal																																				
Tibia - proximal																																				
Tibia - distal																																				
Fibula - proximal																																				
Fibula - distal																																				
Patella																																				
Calcaneum																																				
Astragalus																																				
Other tarsals																																				

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