Field and Technical Report

LARGE MAMMAL REMAINS FROM THE 100 KA MIDDLE STONE AGE LAYERS OF BLOMBOS CAVE, SOUTH AFRICA

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ABSTRACT

The large mammal remains from the c. *100 ka layers of the M3 phase at Blombos Cave in the southern Cape, are reported. A wide range of mammal taxa are present, dominated by small game animals, including rock hyrax, Cape dune molerat, steenbok/grysbok and Cape fur seal. These taxa also dominate other important Middle Stone Age sites on the southern and western coast of the Western Cape of South Africa. There is sufficient evidence that most of the mammals, including rock hyrax and Cape dune molerat, were collected by humans. The fauna suggests an open and rocky environment, as well as moist conditions.*

Key words: Blombos Cave (BBC), large mammals, small game animals, Middle Stone Age, human activities.

INTRODUCTION

The Middle Stone Age (MSA) of South Africa has contributed substantially to an understanding of the evolution of anatomically modern humans and their behaviour (Henshilwood 2012). A number of deeply stratified cave-sites on the southern and Western Cape coast of South Africa have been excavated with the most prominent in terms of faunal remains being Klasies River Main Site (Singer & Wymer 1982), Die Kelders (Avery *et al.* 1997), Blombos Cave (Henshilwood *et al.* 2001; Thompson & Henshilwood 2011, 2014a,b; Discamps & Henshilwood 2015), Pinnacle Point (Marean *et al.* 2004), Herolds Bay (Brink & Deacon 1982), Ysterfontein (Halkett *et al.* 2003; Klein *et al.* 2004; Avery *et al.* 2008) and Diepkloof (Parkington & Poggenpoel 1987; Steele & Klein 2013).

The hunting capabilities of MSA hunters have been the subject of debate for some time. The earlier human scavenging hypotheses (Binford 1981) are no longer accepted (Marean & Assefa 2005: 117). One of the more enduring viewpoints is that MSA people were less effective hunters than Later Stone Age hunters (Klein & Cruz-Uribe 1996). This argument is based, amongst others, on the presence of large numbers of docile eland during the MSA, and few aggressive buffalo and bushpig in samples from the southern Cape (but see Weaver *et al.* 2011). The fully effective hunter model has gained more support, especially in recent times (Brink 1987; Milo 1998; Plug 2004; Marean & Assefa 2005; Clark & Plug 2008; Faith 2008; Dusseldorp 2010; Badenhorst & Plug 2012). In this paper, we report on the large mammal remains from the *c.* 100 ka layers from Blombos Cave. Few faunas from this time have been reported, and the results provide insights into subsistence behaviour of anatomically modern humans.

BLOMBOS CAVE

Blombos Cave (BBC) is situated in a steep wave-cut calcrete cliff, 34.5 m above sea level and 100 m from the Indian Ocean in the southern Cape, South Africa (34°25′S, 21°13′E; Fig. 1). The cave contains both MSA and Later Stone Age (LSA) deposits. The MSA layers at BBC date to between ~72 and 100 ka. The sequence is divided into three phases, from top to bottom, the M1, M2 (upper and lower) and M3 (Fig. 2). The age of the M3 phase ranges from *c.* 101–94 ka (Henshilwood *et al.* 2011). The upper layers (layers CH–CJ) of the M3 phase are characterised by dense, well-preserved shell deposits and basin-shaped hearths. The layers below CJ contain much lower concentrations of artefacts and fauna. Ochre is common in the M3 and at least eight pieces have deliberately engraved patterns (Henshilwood *et al.* 2009).

MATERIALS AND METHODS

The M3 fauna was identified according to the methods proposed by Driver (1999). According to this method, all specimens that could be assigned to an element (e.g. humeri, femora, etc.) were considered 'identifiable'. For class-level identifications, four arbitrary size categories were used. 'Indeterminate small mammals' are those specimens equal in size to rock hyrax (*Procavia capensis*) and smaller taxa. 'Indeterminate medium mammals' represents animals similar in size to Bovid I, II and small to medium carnivores. 'Indeterminate large mammals' include Bovid III, Equidae and large carnivores. Bovid IV, hippopotami (*Hippopotamus amphibius*), rhinoceros (Rhinocerotidae) and elephant (*Loxodonta africana*) would be animals included under 'Indeterminate very large mammals'. The size categories for the bovids follow Brain (1974). The ageing, skeletal parts and agent(s) of accumulation of rock hyraxes from the sample have been discussed elsewhere (Badenhorst *et al.* 2014).

For this study, we analysed the mammalian (only those larger than Cape dune molerat and rock hyrax) faunal remains excavated between 2001 and 2010 from the M3 phase (layers CH to CL and their sub-layers). The Cape dune molerat (*Bathyergus suillus*) and rock hyrax remains are included but birds, reptiles, amphibians, fish and micromammals were not analysed. The sample we analysed has not been part of previous studies (Henshilwood *et al.* 2001; Thompson & Henshilwood 2011; Badenhorst *et al.* 2014; Reynard *et al.* 2014; Thompson & Henshilwood 2014a,b; Discamps & Henshilwood 2015). While Thompson and Henshilwood (2011) made some taxonomic

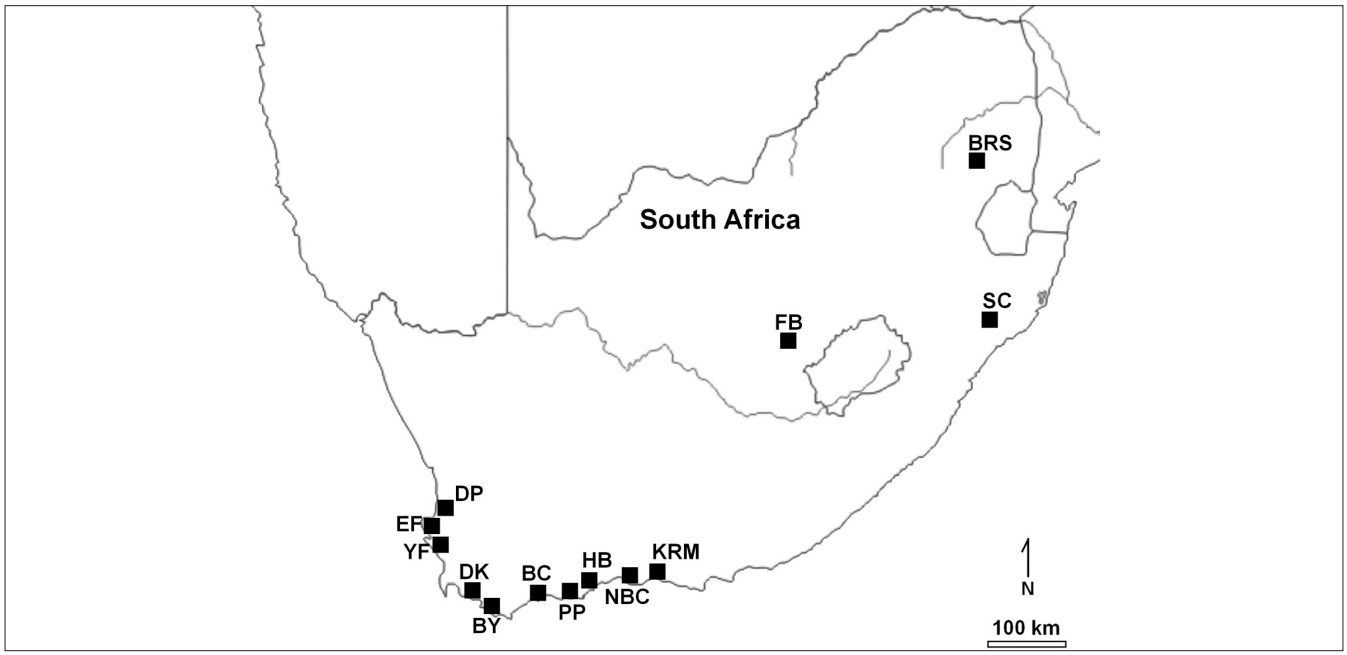

FIG. 1. *Approximate location of sites mentioned in the text: BC, Blombos Cave; BRS, Bushman Rock Shelter; BY, Byneskranskop; DK, Die Kelders; DP, Diepkloof; EF, Elandsfontein; FB, Florisbad; HB, Herolds Bay; KRM, Klasies River Main; NBC, Nelsons Bay Cave; PP, Pinnacle Point; SC, Sibudu Cave; YF, Ysterfontein.*

identifications, the fauna was not identified below family level. For the present paper, we draw on the naked-eye observations, supported by other detailed taphonomic studies on the BBC fauna (Reynard 2011; Thompson & Henshilwood 2011; Badenhorst *et al.* 2014).

The unidentified specimens were not quantified, and a sample of these has been subjected to an independent study (Reynard *et al.* 2014). During excavations, the faunal remains were screened through 1.5 and 3 mm screens. Only the specimens recovered from the 3 mm screens are included here. Notwithstanding the serious limitations of the Minimum Number of Individuals (MNI; e.g. Lyman 2008), the fauna from the M3 are presented according to Number of Identified Specimens (NISP) as well as MNI for comparative purposes. For NISP, each element was counted separately. For example, a mandible with a single intact tooth, was counted as two. All characteristics (side, age, sex and size) were taken into consideration when MNI was calculated (see Reitz & Wing 1999).

RESULTS

A total of 3783 specimens were identified from layers CH–CL. This sample is larger than that identified from the M3 previously (Henshilwood *et al.* 2001), which consisted of 1213 large mammal specimens from layers CGB/CH to CP. A wide variety of mammalian taxa were identified (Table 1), including carnivores, rhinoceros, rock hyraxes, bovids, rodents and hares. The most common taxa (identified to order-level or higher) include rock hyrax, Cape dune molerat, steenbok/grysbok (*Raphicerus* sp.) and Cape fur seal (*Arctocephalus pusillus*). These taxa occur in all layers. Most of the indeterminate small and medium mammal specimens are likely from rock hyraxes, Cape dune molerat and steenbok/grysbok. During analysis, it was not possible to consistently distinguish between steenbok and Cape grysbok (*cf.* Steele & Klein 2013: 3455), two closely related taxa.

The extinct giant buffalo (*Syncerus antiquus*) from layer CJ Hearth 1 is a right adult mandible with the P2, P3, P4, M1, M2, and M3 present. The length of each tooth is: (P2) 17.50 mm; (P3) 26.74 mm; (P4) 29.60 mm; (M1) 32.28 mm; (M2) 39.80 mm; and (M3) 55.09 mm. Moreover, the length of the M3 from our sample is larger than extant buffalos (average 37.28 mm, n = 14), and more similar to the extinct buffalo from Elandsfontein Main Site (average 50.95 mm, n = 51), Klasies River Main Site (average 47.76 mm, n = 25), Nelson Bay Cave (average 40.37 mm, n = 9) and Byneskranskop Cave 1 (average 40.05 mm, n = 11) (Klein 1994: 731).

Both leopards and brown hyaenas feed on *Raphicerus*. The low carnivore/ungulate ratio (Thackeray 1990; also Brain 1981) indicate very low leopard and brown hyaena activity (Table 2). Moreover, the frequency of carnivores to ungulates does not differ significantly across stratigraphic units (chi-square 3.05, d.f. = 3, P = 0.348, Cramer's V = 0.0726). This is further supported by the fact that only one indeterminate hyaena specimen was identified from our sample, and no baboons (leopards and brown hyaenas often prey on baboons [Brain 1981]). A total of 29 carnivore specimens are present, excluding seals, representing 1% of the sample size.

The fragmentation of long bones has been used to investigate human *versus* natural accumulations of rock hyrax from MSA sites in southern Africa (Badenhorst *et al.* 2014). The idea is that a dominance of fragmented long bones is consistent with human activity (also see Brain 1981). If we apply the same approach to Cape dune molerats from our sample, only 3% of the long bones are complete (Table 3). Moreover, raptors such as eagles, and carnivores such as leopards consume the post-crania of small prey, leaving large quantities of skull remains behind (Brain 1981; Badenhorst *et al.* 2014). In all the layers of our sample, and despite the small sample sizes of layers CK and CL, crania of Cape dune molerat are poorly represented, compared to post-crania (Table 4). These factors suggest that Cape dune molerats were introduced by humans.

The sample yielded further evidence for human activities. The naked-eye modifications noted on the sample include seven specimens which have cut/chop marks (on rock hyrax, steenbok/grysbok, as well as indeterminate Bov II, III and medium mammals). A total of 9% of the identified sample are burnt, with the colours brown and black being the most common. The majority of burnt specimens are from small mammals such as rock hyrax (n = 86) and Cape dune molerat (n = 35). Mandibles of Cape dune molerat (n = 3), hare (n = 2) and rock hyrax

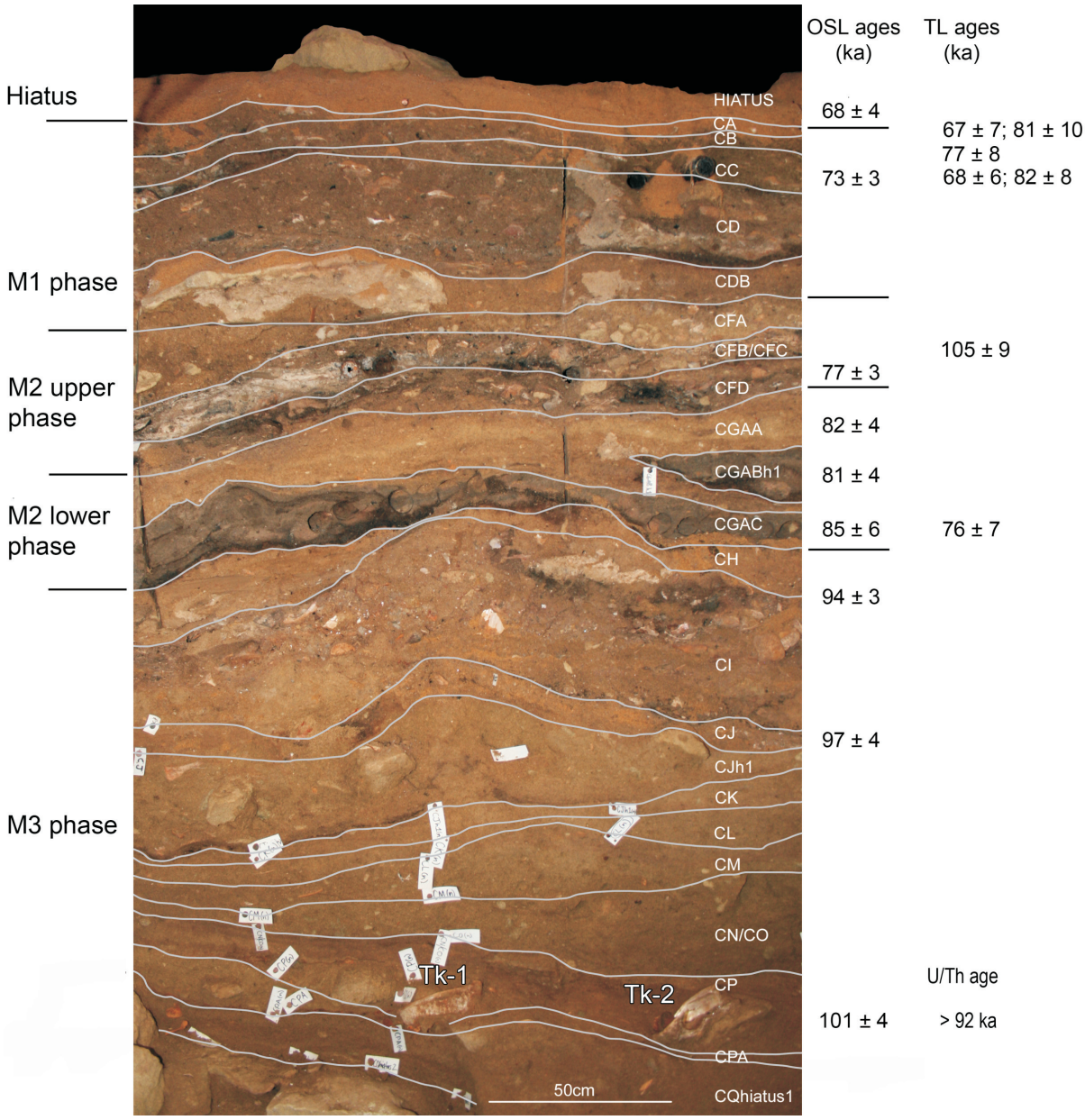

FIG. 2. *South section showing the stratigraphy and ages of the Middle Stone Age layers at Blombos Cave.*

($n = 1$) show similar burning to that described by Henshilwood (1997). A phalanx of a seal from layer CJ has ochre staining on the shaft.

Despite the evidence for human accumulation of fauna, there is some evidence for carnivore and perhaps raptor activities. Six specimens were digested (rock hyrax, possibly Cape dune molerat, and indeterminate small mammal), and a further 19 had carnivore (Cape fur seal, rock hyrax, bontebok, Bov I, Cape dune molerat and indeterminate small and medium mammals) and four rodent gnaw marks. These results are broadly similar to a microscopic examination of the M3 fauna, which indicate that about 27% of the specimens yielded cut marks, 24% tooth marks, and about 7.4% were digested (Thompson & Henshilwood 2011).

DISCUSSION AND CONCLUSION

The sample from BBC indicates that small prey dominate the MSA (and LSA) sample at BBC, a pattern also found at other coastal MSA sites (Klein 1976; Singer & Wymer 1982; Klein & Cruz-Uribe 2000; Steele & Klein 2013). The pattern of animal exploitation is different at inland sites. For example, at Sibudu Cave (Plug 2004), Bushman Rock Shelter (Badenhorst & Plug 2012) and Florisbad (Brink 1987), larger mammal taxa are more prevalent.

The predominance of small prey at coastal MSA sites such as BBC could be due to the following: smaller game animals, such as Cape dune molerat, are relatively fast reproducers, and hunted individuals are quickly replaced. However, they are also common on rocky cliffs and in sandy soils, like those surrounding BBC (Henshilwood 2008). Cape dune molerats also occur naturally only in the Western Cape region (Skinner & Chimimba 2005). Moreover, some medium and large bovids move seasonally between grazing regions, and they may not always have been present in the immediate vicinity of BBC. It is also conceivable that people hunted larger mammals, but these were butchered and consumed at the kill site, or that only meat (and no or few bones) was transported back to BBC. In addition to these anthropogenic and natural factors, bone remains of taxa such as Cape dune molerats and rock hyraxes are easily identified as they are highly diagnostic. This aspect likely increased the numbers of specimens attributed to these taxa.

The giant buffalo, closely related to extant buffalos, became

TABLE 1. *Taxa present at Blombos Cave during the M3 (NISP/MNI). *KC = Analysis by R.G. Klein and K. Cruz-Uribe (from Henshilwood* et al. *2001).*

Taxa	Common name	CH–CI	CJ	CK	CL	Subtotal	KC*	Grand total NISP
Homo sapiens	Anatomically modern human						1/1	1
Erinaceus frontalis	African hedgehog						4/1	4
Canis mesomelas	Black-backed jackal						1/1	1
Aonyx capensis	Cape clawless otter						1/1	1
Ictonyx striatus	Striped polecat	1				1/1	2/1	3
Arctocephalus pusillus	Cape fur seal	31	22	5	5	63/3	60/2	123
cf. Arctocephalus pusillus	Possibly Cape fur seal	1	2			3/–		3
Genetta sp.	Genet						2/1	2
Galerella pulverulenta	Cape grey mongoose	2	1			3/1	10/2	13
Herpestidae	Mongoose	3	2	1		6/–		6
Hyaena/Crocuta	Hyaena		1			1/1	1/1	2
Felis silvestris	African wildcat	2	1			3/1	2/1	5
Felis cf. silvestris	Possibly African wildcat	1				1/–		1
Felidae	Felid		1			1/–		1
Carnivore small	Small carnivore	3				3/–		3
Carnivore small-medium	Small-medium carnivore	1	4	1	1	7/–		7
Carnivore medium	Medium carnivore	1		1		2/–		2
Carnivora	Indeterminate carnivore	1				1/–		1
Delphinidae	Dolphin						2/1	2
Diceros bicornis	Black rhinoceros						1/1	1
Rhinocerotidae	Rhinoceros	1				1/1	3/1	4
Equus capensis	Extinct Cape zebra						4/1	4
Procavia capensis	Rock hyrax	548	324	51	52	975/12	408/19	1383
cf. Procavia capensis	Possibly rock hyrax	56	23	3	2	84/2		84
Hippopotamus amphibius	Hippopotamus	1				1/1		1
Alcelaphus buselaphus	Red hartebeest	1				1/1		1
cf. Alcelaphus buselaphus	Possibly red hartebeest		2			2/–		2
Alcelaphus/Hippotragus	Hartebeest/sable/bluebuck/roan				1	1/–		1
Alcelaphus/Connochaetes	Hartebeest/wildebeest						1/1	1
Damaliscus dorcas	Bontebok	2				2/1		2
cf. Damaliscus dorcas	Possibly bontebok	2				2/–		2
Damaliscus/Redunca	Bontebok/reedbuck	1				1/–		1
cf. Antidorcas	Possibly springbok	1				1/1	1/1	2
Oreotragus oreotragus	Klipspringer	1				1/1		1
Raphicerus campestris	Steenbok						4/4	4
Raphicerus cf. campestris	Possibly steenbok	5	1		1	7/1		7
Raphicerus melanotis	Cape grysbok	3				3/1	3/1	6
Raphicerus cf. melanotis	Possibly Cape grysbok	1				1/–		1
Raphicerus sp.	Steenbok/grysbok	53	27	5		85/2	56/8	141
cf. Raphicerus sp.	Possibly steenbok/grysbok	11	9	3		23/1		23
Pelea capreolus	Grey rhebuck						1/1	1
Syncerus/Bos	Buffalo/cattle						1/1	1
Syncerus antiquus	Extinct giant buffalo		7			7/1		7
Tragelaphus oryx	Eland	6	2	3	4	15/1	15/2	30
cf. Tragelaphus oryx	Possibly eland		1			1/–		1
Redunca arundinum	Southern reedbuck		1			1/1	6/1	7
Bov I	Small bovid	132	46	6	1	185/3	242/8	427
Bov I/II	Small-medium bovid	1		2		3/–	61/2	64
Bov II	Medium bovid	52	34	3	2	91/1		91
Bov II/III	Medium-large bovid						62/2	62
Bov III	Large bovid	29	9	1	2	41/2	72/2	113
Bov III/IV	Large-very large bovid	22	18		1	41/1		41
Bov IV	Very large bovid	24	7	1	1	33/1		33
Hystrix africaeaustralis	Porcupine						1/1	1
Bathyergus suillus	Cape dune molerat	177	98	8	10	293/16	168/8	461
cf. Bathyergus suillus	Possibly Cape dune molerat	38	14	2	2	56/–		56
Lepus saxatilis	Scrub hare	1				1/1	11/2	12
Lepus cf. saxatilis	Possibly scrub hare	2	2			4/1		4
Lepus capensis	Cape hare						6/1	6
Lepus sp.	Hare	17	14	1	1	33/1		33
cf. Lepus sp.	Possibly hare	3		1		4/–		4
Mammal small	Small mammal	766	391	36	35	1228/6		1228
Mammal medium	Medium mammal	196	109	9	7	321/3		321
Mammal large	Large mammal	97	29	6	7	139/2		139
Total NISP		**2297**	**1202**	**149**	**135**	**3783**	**1213**	**4996**

TABLE 2. *Carnivore/ungulate ratio at BBC.*

Layer	Carnivore NISP	Ungulate NISP	Ratio
CH–CI	15	349	4.3
CJ	10	164	6.1
CK	3	24	12.5
CL	1	13	7.7

TABLE 3. *Long bone fragmentation of Cape dune molerat from BBC (NISP).*

Layer	Fragmented	Complete
CH–CI	53	0
CJ	17	2
CK	4	0
CL	2	0
Total	76	2

TABLE 4. *Cape dune molerat crania* vs *post-crania at BBC (NISP).*

Part	CH–CI	CJ	CK	CL	Total
Crania	23	8	–	1	32 (10%)
Teeth	20	11	2	1	34 (10%)
Post-crania	155	86	8	8	257 (80%)

extinct during the Holocene. Their remains have been found from the Western Cape to Mediterranean North Africa. However, the limited numbers of localities make it impossible to establish whether this distribution was continuous or not (Klein 1994; Plug & Badenhorst 2001). In the Western Cape region as well as elsewhere, extinct buffalos have been found at several MSA sites (Klein 1976; Avery *et al.* 1997; Klein & Cruz-Uribe 2000; Marean *et al.* 2004; Plug 2004; Steele & Klein 2013).

Cape dune molerats are still abundant in the area surrounding BBC today (Skinner & Chimimba 2005). They live in burrows, and these systems can be several hundred metres in length. They are sensitive to air currents, and have the ability to detect when their burrows are opened. In addition, they have a keen sense of hearing and they react immediately to outside noises (Skinner & Chimimba 2005: 81). This suggests that they are not easily caught by their predators. It may even have been possible that people smoked them from burrows, given their sensitivity to air currents.

The predators of Cape dune molerats (snakes, jackals and caracals), do not frequent caves to consume their prey on a regular basis. Eagles may consume Cape dune molerats, but they do not enter caves to construct nests (Badenhorst *et al.* 2014). The fragmentation of long bones (the ratio of complete *vs* fragmented long bone elements) of Cape dune molerat is similar to that for rock hyraxes, hares and springhares from open-air, first and second millennium AD farming sites in South Africa (Badenhorst *et al.* 2014). The latter taxa were without doubt accumulated by humans, and similarity in long bone fragmentation suggests that the Cape dune molerats from BBC were also accumulated by humans.

The taphonomic modifications noted on the specimens in the current sample reflect both human and animal activity in BBC. The burnt specimens are the result of people making fires in the cave. In some instances, for example, the burnt premaxillae of Cape dune molerat are the direct result of cooking (Henshilwood 1997). It is very unlikely that the floor of the shelter would burn naturally, owing to the lack of organic cover. The cut and chop marks resulted from the skinning and butchering of animals by people. Although such marks are not abundant in the sample, actualistic studies have indicated that despite skinning and butchering taking place, little visible evidence is present (Parsons & Badenhorst 2004).

The few specimens with carnivore chew marks as well as the presence of digested remains indicate that, in the current sample, carnivore activity was likely very low at BBC, confirming previous studies (*cf.* Henshilwood *et al.* 2001; Thompson & Henshilwood 2011; but also see Marean *et al.* 2000). The possibility cannot be excluded that some of the digested specimens were the result of consumption by people. The notion of low carnivore activity at BBC is further supported by the difference in sample composition between BBC and Herolds Bay, located on the southern Cape coast, and which predates 91.9 ±3.8 ka (Harris *et al.* 2014). The faunal sample from Herolds Bay was accumulated through carnivore and porcupine activities. The sample consists of clusters of accumulated bone with porcupine gnaw marks; relatively complete bones; hyaena coprolites; carnivores (except Cape fur seal) well represented especially brown hyaenas, with *Raphicerus, Lepus* and *Procavia* well represented and having a high incidence of carnivore damage; a complete cranium of bluebuck (*Hippotragus leucophaeus*); the presence of only young Cape grysbok (*Raphicerus melanotis*) and only old bluebuck individuals; and large bovids best represented by post-cranial remains compared to medium-large and medium-small bovids poorly represented by post-cranial remains. The deposits also lacked cultural artefacts (Brink & Deacon 1982). Moreover, the faunal composition of BBC is also different from other Pleistocene samples accumulated by carnivores, such as porcupines, hyaenas, leopards or owls, in that the sample lacks porcupine gnaw marks and diagnostic leopard damage, as well as the presence of bone flakes and cultural artefacts (Brain 1981; Badenhorst *et al.* 2014).

The taxonomic composition of the M3 mammalian fauna indicates that the environment was characterised by a combination of aeolianite cliffs (rock hyrax), sandy substrate (Cape dune molerat), and a closed (steenbok/grysbok) as well as open (extinct buffalo, springbok) element in the local environment (*cf.* Skinner & Chimimba 2005; Plug 2014). Some of the taxa from the sample are grazers, such as the extinct Cape zebra and extinct buffalo (Plug 2014). The presence of relatively large numbers of seals indicates the proximity of the ocean at BBC during the M3. The presence of hedgehog and southern reedbuck has previously been used to suggest moister than historical conditions at BBC (Henshilwood *et al.* 2001). However, hedgehogs occur currently in environments with rainfall ranging between 300 and 800 mm per annum (Skinner & Chimimba 2005). At Still Bay, the town closest to BBC, annual rainfall ranged between 380 mm and 470 mm between 1926 and 1950, with an average of 430 mm of rainfall per annum for 1980 to 1992 (Henshilwood 2008). Therefore, only the presence of reedbuck is indicative of moister conditions during the M3.

It is conceivable that people only visited and occupied BBC for short time periods, perhaps returning occasionally (*cf.* Henshilwood 2008). If people only made occasional use of BBC during the M3, this may be reflected in the animal remains. Seals give birth between late November and early December (Skinner & Chimimba 2005). The single neonate seal from layer CI at BBC was therefore either caught or collected shortly afterwards, indicating a summer occupation. Based on rock hyrax aging, BBC was used during both warmer and colder months. The rock hyrax sample is dominated by neonate (10%) and juvenile (45%) post-cranial elements (Badenhorst *et al.* 2014).

The macrofaunal remains from the M3 at BBC offer insights into prey selection strategies of early modern humans in the southern Cape during the Middle Stone Age. The large mammal fauna from the M3 phase at BBC indicates a dominance of small game such as rock hyraxes, Cape dune molerats and steenbok/grysbok. Other coastal sites on the southern and western coast of South Africa also display the same pattern, whereas larger mammals often dominate MSA samples from the interior of the region. Most of the large mammals in the BBC M3 sample were accumulated by humans, although there are indications for at least some carnivore activities.

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