HOLOCENE PREHISTORY OF THE SOUTHERN CAPE, SOUTH AFRICA:

EXCAVATIONS AT BLOMBOS CAVE AND THE BLOMBOSFONTEIN NATURE RESERVE

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PREFACE

During 1992/3 nine Later Stone Age (LSA) coastal midden sites ranging in age from 6960 B.P. to 290 B.P., and representing 28 depositional units were excavated in the Blombosfontein Nature Reserve and in the directly adjacent Blombos Estates, situated 20 km to the west of Still Bay, southern Cape, South Africa (Figs. 1.1). This research formed the core of the authors doctoral thesis ‘Holocene archaeology of the coastal Garcia State Forest, southern Cape, South Africa’ completed at Cambridge University in 1995 (Henshilwood 1995). This monograph is based on the results derived from this research. Additional data derived from the 1997 – 1999 excavations of the Later Stone Age levels at Blombos Cave (BBC) has been added into the text (also see appendix) and a brief review of the results from the 1997 – 2005 excavations of the Middle Stone Age (MSA) levels is included.

In this monograph the term Blombosfontein is used to cover both the Blombosfontein Nature Reserve and the Blombos Estates. On some older topographical maps the area is designated Garcia State Forest but the currently accepted name is Blombosfontein (lit. flower bush spring). The sites excavated were originally numbered from 1 – 9 and given the acronym GSF (Henshilwood 1995). In this monograph the acronym has been changed to BBF (for Blombosfontein); BBF 1 is the oldest and BBF 9 the youngest site (Fig. 1). Blombos Cave, previously given the acronym GSF 8, is renamed BBC in this monograph as this is the acronym in current use (Henshilwood *et al* 2001a). The original excavations at this site in 1992 revealed Middle Stone Age (MSA) deposits but excavation in these levels was limited and the age of the deposits could not be determined. Subsequent excavations of the MSA levels show that the BBC deposits range in age from over 140 000 years to less than 300 years (Henshilwood *et al* 2001a; Jacobs *et al* 2006). Excavation of these MSA levels is continuing (Henshilwood 2008).

Primary objectives of the Blombosfontein Research Project

The primary objectives of the initial research at Blombosfontein were to examine the economic and cultural diversity present within and across these nine coastal middens. Although a few isolated sites had been excavated on the southern and south-western Cape coast previously, for example Die Kelders, Byneskranskop 1 and Nelson Bay Cave (Fig. 1.1), the BBF project was the first study in this region which involved a detailed examination of multiple sites located in close proximity to one another. The 3.5 sq. km Blombosfontein area is well suited to a project of this kind. There are 21 Later Stone Age sites of various ages, size and location in the area. Although a number of these sites had the potential to meet the objectives of the project, 9 sites were eventually chosen for excavation based on their age, contents, location and state of preservation. Other factors taken into consideration included whether they were single or multiple occupation sites, and the amount of *in situ* deposit.

The core of the project revolved around the excavation of the 9 sites and the subsequent analysis and interpretation of the recovered data. The area and extent of a site to be excavated was carefully marked out in order to retrieve as representative a sample of that site as was possible within the confines of the project. Prior to the commencement of excavation it was realised that the project could not only be centred on the recovered assemblages but would need to be extended to address a multiplicity of other issues.

Initially, the foremost of these was palaeoenvironmental. To what extent had the ecology of the BBF area altered over the last 7000 years in terms of vegetation cover and the range of terrestrial fauna, and what effect had changes in sea levels, erosion, currents etc. had on the morphology of the coastline and its resources? Basically, we needed to know whether the inhabitants of the earliest site excavated, BBF 1, had the same set of resources to choose from as did the group who were the last occupants at Blombos Cave (BBC), about 350 years ago. If they did, then what factors may have motivated one group to select a particular set of resources for exploitation and another group a different set and, if this was the case, would we be able to recognise these differences from the archaeological record and/or relate them to environmental change? On the other hand, if environmental factors were responsible for changing the range and mix of exploitable resources at different times, how did human subsistence patterns change to meet the different demands placed on them by these ecological shifts?

The location of the BBF sites are distinctly patterned, the earlier sites are all situated in the elevated dune-field at least 90 m a.s.l. (Fig. 5.2) One interesting exception is an extensive, multi-layered midden situated on a coastal promontory at the base of the cliffs which dated to around 4000 B.P. All the sites which post-date 2000 B.P., a date which coincides with the arrival of the first groups of pastoralists in the southern Cape, are located in small shelters situated in the coastal cliffs. Was this change in site location at 2000 B.P. coincidental, could it be related to environmental factors or was it due to pressures placed on hunter gatherer groups by the arrival of herders? There is also a noticeable decrease in the size of sites occupied in the post- 2000 B.P. era suggesting that the size of hunter gatherer bands decreases in the later period.

One method of examining the social interaction between herders and hunter gatherers was to investigate the ethnohistoric accounts of early European travellers to the region. The earliest written records date to around the period of the last occupations at BBF. Although the numbers of ethnohistoric coastal observations are sparse they contained some information relating to the use of the near coastal area, both by herders and, unfortunately, less so, hunter gatherers. However, it was also realised that while ethnohistoric accounts may provide some insight into the demographics and social relations of indigenous people in the southern Cape at around 300 - 400 years ago, it would be be imprudent to extrapolate this information back in time and apply it to the earlier occupations at BBF. Therefore, the only information we had to work with, which would assist in interpreting the earlier BBF occupations, was that contained in the excavated archaeological assemblages. This data also had its limitations. In most cases there were gaps of hundreds of years between occupation units and these could be interpreted in a number of ways. Either the BBF area was not occupied during these interim periods, or the evidence of these occupations was buried under the dunes or had not survived. It was also possible that during the last 7000 years ecological factors had, at times, made the BBF area less attractive for human occupation. Although climatic conditions on the western Cape coast were markedly different to those in the southern Cape during the Holocene, the coastal area in the Eland's Bay area was not occupied between around 8000 - 4000 B.P., suggesting that sections of the Cape coast *were* abandoned when ecological conditions were not conducive to human exploitation.

Fortunately, the two well-excavated and radiocarbon dated sites at Nelson Bay Cave (Fairhall & Young 1973; Inskeep 1965, 1987) and Byneskranskop 1 (Schweitzer & Wilson 1982) (Fig. 1.1), situated respectively on the southern and south-western Cape coast, provide a useful comparative measure for the BBF sequence, despite the geographical distance separating the three sites. A fairly extensive review of the cultural sequence of the southern, south-western and eastern Cape during the Holocene, gained mainly from the excavation of sites located inland, was available for consultation and provided practical insights into the differences between the lithics from sites situated to the west of the Gouritz River, including BBF, and those in the eastern sector.

Shellfish recovered from BBF sites are regarded as one of the key components in examining the range of diversity relating to marine subsistence strategies, both over time, but also in relation to site location and site type. On the southern Cape coastline different species of shellfish occur within each of the intertidal zones. This means we are able to determine the range of the intertidal zone exploited by the inhabitants at each site, and also possibly whether visits were timed to coincide with low spring tides as certain species would only have been accessible during these periods. The range of shellfish species at a site may also reflect the ecology of the coastline at the time, and provide information on the effects of varying sea levels, sea surface temperatures and salinity. Measuring the size of shellfish species from each site is a useful yardstick for gauging not only changes in mean sizes over time but also for examining the effects of varying sea temperatures on growth rates and/or human predation pressures which may reduce or increase the mean size of a species.

Although some of the BBF middens are almost exclusively shell dumps, the majority of sites in the area point to the pursuit of a range of subsistence activities, apart from shellfishing. Thus, while shellfish may have been one of the main attractions for visiting coastal areas it seems that other food resources also formed a major part of human subsistence strategies while at the coast. Poor bone preservation at open sites which predate 2000 B.P. precludes us from making any definitive statements about the ratio of shellfish to other fauna exploited during the earlier BBF occupations, with the exception of the regular presence of tortoise bone and some fish. However, there are some clues which point to the exploitation of fauna other than shellfish at these sites. During excavation large weathered bone fragments were frequently encountered within the earlier assemblages but could not be identified to taxa. The presence of stone scrapers at most of the early sites, in particular the very large number at BBF 4, suggests that hide working was included in the range of activities carried out at a site.

At the youngest sites, BBC & BBF 9, the range and quantity of fauna other than shellfish points to the utilisation of a wide range of foods, most of which were probably found within the BBF area. The presence of sheep in the oldest LSA layers at BBC is of singular significance as the direct dating of the sheep bone by the accelerator radiocarbon method produced a date of 1960 ± 50 B.P., the earliest recorded appearance of sheep in the southernmost regions of the Cape (Henshilwood 1996).

The lithics, particularly those from BBF sites dating to the mid-Holocene, raise a number of interesting questions. While the formal tool component is dominated by a range of microlithic tools made in fine-grained raw materials, particularly silcrete, and therefore can be described as broadly conforming to the well described Wilton tradition in certain respects, there are also fundamental differences. The ratio of backed elements, which were presumably hafted, is out of all proportion to that described for formal tool assemblages from sites to the east of BBF. Backed scrapers are ubiquitous, particularly at BBF 4, and confirm the evidence from sites such as Byneskranskop and possibly Brakfontein, located to the west of BBF, which are also dominated by backed formal tools. Could these differences be ascribed to variations in the range of activities carried out at sites to the east and west of the Gouritz River, did hafted tools perform some special function which was confined only to a certain area or did groups in the east follow a different trajectory in the development of stone tool manufacturing techniques to those in the more western areas?

Attempting to establish the season of occupation of shell middens is an integral part of many prehistoric coastal studies and raised a number of issues in the BBF project. Were the BBF sites consistently occupied during certain seasons only, for how long were they occupied and did the exploitation of coastal resources form only a part of a greater seasonal round? If, as the evidence from BBF suggests, the occupation of coastal sites was relatively brief did these groups move on to other coastal locations or possibly head inland to maximise on seasonal resources elsewhere? Oxygen isotope analysis of shell carbonates had demonstrated that seasonality could be tested at southern Cape sites (cf. Shackleton 1973) and it was this method that was applied to two species of shells, *Scutellastra tabularis* and *Turbo sarmaticus*, which were recovered from BBF sites.

The Middle Stone Age levels at BBC

Excavations at Blombos Cave (BBC) were restarted in 1997 and are continuing. The emphasis now is on excavating the Middle Stone Age (MSA) levels that date from c. 70 ka - > 140 ka (Jacobs *et al* 2003 a,b, 2006). The 1997 – 2008 excavations of the MSA levels at BBC have allowed for a sound understanding of the stratigraphic complexity of the site that is complex due to slumping, folding and faulting of the deposits (Henshilwood *et al*, 2001a; Henshilwood 2005).
Three phases of MSA occupation have been identified named M1, M2 and M3 (Fig. 5.24). Dating by the optically stimulated luminescence (OSL) (Henshilwood *et al* 2002; Jacobs *et al* 2003a,b, 2006) and thermoluminescence (TL) methods (Tribolo 2003; Tribolo *et al*, 2005, 2006) have provided occupation dates for each phase: these are c. 73 ka for the M1 Still Bay phase (oxgen isotope stage - OIS 5a/4), c. 77 for the M2 Still Bay phase (OIS 5a), c. 80 ka for the M2 low density phase (layers CGAA, CGAB, CGAC), and c. 100 - >140 ka for the M3 phase (OIS 5e/6). The stratigraphically secure occupations in each phase are relatively brief and the depth of deposit per layer is mostly less than 10 cm. A hiatus period represented by sterile aeolian sand separates the LSA deposits from those of the MSA, and low density deposits also separate the M2 and M3 phases (M2 hiatus). This depositional history suggests that Blombos Cave was occupied sporadically and for relatively short periods of time with long periods of non-occupation.

Seven human teeth have been recovered from the MSA levels (Grine *et al* 2000; Grine & Henshilwood, 2002). It is highly probable the hominids at BBC were anatomically modern. Fish bones, in particular those of large specimens, occur throughout the MSA layers at BBC, albeit in small numbers. It is possible the fish were lured close to shore by chumming and then speared, possibly with bone or stone tipped projectiles (Henshilwood *et al* 2001a). Shellfish are extensively exploited in the MSA at BBC (Henshilwood *et al* 2001a) and the species represented are similar to those from the LSA levels (Henshilwood 1995). A range of sizes of terrestrial animals were hunted and trapped (Henshilwood *et al*, 2001a).

About 400 bifacial points were recovered from the M1 and M2 phases. More than 60 % of bifacials in M1 and more than 99% in M2 are made in silcrete, an exotic raw material (Henshilwood *et al* 2001a; Villa *et al* submitted). Bone tools are found in the M2 and M1 phases and more than 50 have been recovered. (Henshilwood *et al*, 2001b; d'Errico & Henshilwood 2007). The production of the

BBC bone tools results from a sequence of deliberate technical choices starting with blank selection up to the final shaping of the finished artefact. MSA tools are shaped using at least one or multiple techniques (Henshilwood *et al* 2001b). An engraved bone fragment was recovered from the Still Bay levels (d'Errico *et al* 2001)

Ochre is ubiquitous in the M3 phase and 4000 pieces, many of them very small, have been recovered from the small sample excavated. Two thousand pieces come from the upper phases and many of these are also fragments (Henshilwood *et al*, 2001a; Watts 2002). Traces of utilisation are common and the finds include crayons and stone tools with ochre on their working edges. (Watts 1999, 2002; Henshilwood *et al* 2001a). Fourteen pieces are potentially engraved and under study (Henshilwood *et al* submitted). Two other ochre pieces have been described (Henshilwood *et al*, 2002) and are unequivocally engraved to produce cross-hatched abstract designs.

More than 60 beads made on *Nassarius kraussianus* marine shells recovered from the M1 phase have been described (Henshilwood *et al*, 2004. d'Errico *et al*, 2005). Each bead was deliberately pierced and then strung. Groups of beads came from discrete areas and the wear patterns are similar within groups. The recovery of a number of discrete sets of personal ornaments suggests that the wearing of beads was not idiosyncratic behaviour. Shell that may have been worn as personal ornaments is described from MSA levels at Sibudu Cave, KwaZulu Natal. Beads made on shell of the same genus have been recovered recently from MSA contexts in Algeria and possibly the Levant (Vanhaeren 2006).

The origins of 'modern' human behaviour generates lively debate, world wide (Mellars 1989, 1996, 2005, 2006; Klein 1995, 1999; McBrearty & Brooks 2000; Klein & Edgar, 2002; Henshilwood & Marean 2003, 2006; Henshilwood 2004, 2007; Henshilwood & d'Errico 2005; Henshilwood & Dubreuil in press). Preliminary results from the BBC excavations complement recent and not so recent findings from a number of African MSA sites suggesting that some aspects of modern behaviour may have evolved during the early Late Pleistocene (Henshilwood 2007, 2008, in press). Further analyses of the BBC material and ongoing excavations will, we believe, help provide a firm foundation for assessing the behavioural modernity of African hominids up to and perhaps beyond 140 ka.

CHAPTER 1

INTRODUCTION

Coastal environments, located at the interface of two major ecosystems, namely marine and terrestrial, provide unique advantages for the investigation of past human behaviour (e.g. Bailey 1978, 1983; Bailey & Parkington 1988; Avery *et al* 1997; Jerardino 1992, 1998, 2003; Henshilwood *et al* 2001a; Thomas 2002; Stothert *et al* 2003; Sealy *et al* 2004). On the one hand a suite of marine resources ranging from sessile intertidal organisms, fish, marine mammals and plants are available for human exploitation while on the other hand a choice of terrestrial resources are also accessible. This boundary zone, or ecotone, provides the archaeologist with an opportunity to study the different possibilities and limitations provided by the available range of resources and the way that human subsistence strategies were organised.

Prehistoric shell middens are ubiquitous along the coasts of many parts of the world, for example in north-west and south-eastern America (e.g. Stein 1992; Stein *et al* 1992; Moss 1992; Claassen 1986, 1991a,b; Erlandson *et al* 1999), Australia (e.g. Geering 1982, Hall 1982; Meehan 1983; Beaton 1985), southern and eastern Africa (e.g. Laidler 1935; Avery 1976; Robertshaw 1977, 1979; Buchanan *et al* 1984; Parkington *et al* 1988; Avery *et al* 1997; Jerardino 1998, 2003; Breen & Lane 2003; Sealy *et al* 2004) and in Europe and Britain (e.g. Bailey 1978; Mellars 1987; Deith 1988; Lubell *et al* 2007). In the late 19th and early 20th C. archaeological investigations were being conducted into shell middens, for example in the United States (White 1870; Gifford 1916, 1949) and South Africa (Leith 1898; Colson 1905; Peers 1929; Laidler 1935; Peers & Goodwin 1953), leading to a tradition in which the size of a shell midden became an estimate of prehistoric population size, diet and site age (Stein 1992; Stein & Deo 2003).

Ambrose (1967) classified then state of shell midden research in the 1960s into four categories: examining faunal remains in terms of food supply and calculating meat weights and calories; interpreting changing ecological conditions based on plotting shellfish species acquired from column samples; establishing the positions of ancient shorelines from the locations of shell middens; constructing cultural historical sequences from the recovered artefacts only and ignoring the shellfish remains. Increasingly, since then, the range of research questions and the value of shell midden studies is being realised. The broader objectives of the Oronsay project (Mellars 1987), for example, address a wide range of issues. Basic questions deal with essential subsistence strategies, i.e. establishing the range of resources exploited, strategies of optimisation, and potential variations in the productivity, availability and edibility of these resources on a seasonal basis. In addition, the relationship between the locations of the various middens, whether and why they were occupied once only, or repeatedly, and what factors, environmental or other, influenced these decisions are also questioned as are the functions of the Oronsay middens - were they 'occupation' or 'extraction' sites and why did Mesolithic groups colonise and exploit the resources of Oronsay Island?

Ethnohistoric evidence from Tasmania (e.g. Lourandos 1968; Vanderwal & Horton 1984), Australasia (e.g. Hall 1982; Meehan 1983; Gorecki 1988; Nicholson & Cane 1991; Thomas 2002) and South Africa (e.g. Deacon 1969, 1976; Gordon 1984; Parkington 2001) suggest that coastal resources were used by hunter gatherers on a seasonal basis and that, in some cases, midden sites may represent the accumulation of only a few days occupation. The contents of shell middens are often well suited to testing for seasonality. Many species of fish and marine mammals have strongly migratory patterns, the bony structure of some sea mammals and fish indicate the season of death as do the growth increments in some species of molluscs (Bailey & Parkington 1988). Oxygen isotope analysis of shell carbonates has positively identified the season of occupation at some sites (e.g. Shackleton 1973; Deith & Shackleton 1986). Conversely isotope analysis of human skeletons from a number of sites suggests that at least from dietary evidence some hunter gatherers in the Cape did not move seasonally between the coast and inland (Sealy *et al* 1986, 2000; Sealy & van der Merwe 1985, 1992; Jerardino *et al* 2000).

Other current issues in shell midden research are the effects of post-depositional factors (Schiffer 1983), e.g. groundwater (Stein *et al* 1992), the effects of competition by neighbouring groups of people on coastal subsistence patterns (Bailey & Parkington 1988; Parkington *et al* 1988; Sealy *et al* 2004) and the advantages of excavating a number of coastal sites situated in close proximity to one another (Vanderwal & Horton 1984; Torben & Erlandson 2000; Jerardino 1992, 1998, 2003; Lubell *et al* 2007). Moss (1992) has pointed out that despite the conspicuous nature of shell middens, few archaeologists have explicitly addressed the activities represented by the shell in such deposits, particularly the traditional role of women in shell collecting (also see Meehan 1983; Clarke 2002; Thomas 2002).

Shorelines are dynamic zones which are reshaped by factors such as rising or falling sea levels, land tectonics, changes in the direction and strength of currents and by climate (Hendey & Volman 1986; Shackleton 1988; Bailey & Parkington 1988; Thackeray 1992, 2007; Lambeck & Chapell 2001; Butzer 2004; Mastronuzzia *et al* 2005; Turney & Brown 2006; Carr *et al* 2006; Thackeray 2007; Henshilwood in press). Environmental changes may affect the range and mix of marine resources available for human exploitation (Henshilwood *et al* 2001a; Breen & Lane 2003) leading in some cases to the abandonment of sections of the coastline for long periods, for example in South Africa (Parkington *et al* 1988; Henshilwood in press) and the Mediterranean (Shackleton *et al* 1984; Gamble *et al* 2004), or to the relocation of populations to new coastal sites, as was the case in

Northern Queensland at around 6000 B.P. (Beaton 1985). However, the direction of economic change may not be solely predetermined by environmental factors but, as Bailey and Parkington (1988) point out, it is likely to be a critical factor with regard to the timing of the change (Gamble *et al* 2004; Henshilwood in press).

The 400 km of south-western and southern Cape coastline, between the well excavated and radiocarbon dated sites of Byneskranskop 1 (Schweitzer & Wilson 1982) and Nelson Bay Cave (Fairhall & Young 1973; Inskeep 1965, 1987) has an abundance of shell middens, both in cave and open sites, most of them unrecorded and only a handful excavated. In the area between Pearly Beach and Cape Agulhas alone (Fig. 1.1), Avery (1976) counted 205 open shell middens and 17 coastal cave sites. Interestingly 92 % of the open station shell middens are located along rocky shorelines, while only 8 % are found near sandy beaches. In the area between the Breede River mouth and Still Bay the author noted over 80 shell middens most of which were situated above sections of rocky shore. From 2003 – 2008 during various surveys along the De Hoop coastline, located just east of Cape Agulhas, the author and students recorded 141 Later- and Middle Stone Age shell middens, some in the open and some in caves or shelters. Although a few coastal sites between Cape Agulhas and Cape Seal have been excavated (e.g. Grobbelaar & Goodwin 1952) none of these have been radiocarbon dated. The few site reports which have been published contain little more than a list of the cultural elements of the middens, the faunal component being largely ignored.

Within the coastal Blombosfontein Nature Reserve ($35^0$24’30 S $21^0$12’12 E) also referred to as Blomboschfontein (see topo-cadastral 1:50 000 map 3421 AC Vermaaklikheid), and Blombos Estates (Blombosfontein Erf No. 495/57) the author recorded 21 Later Stone Age sites; 9 of these sites were regarded as suited to the objectives of this project and during excavation 28 discrete depositional units were recorded. The range of site types at BBF, their generally high standard of preservation, and diversity in midden content, provided a unique opportunity to study various aspects of human behaviour on this section of the coast during the period from around 7000 B.P. up until 290 B.P. (Table 5.5). Seven of the sites are open station shell middens, six are elevated at above 90 m a.s.l. and located on a coastal foreland, one is directly adjacent to the coast and all the open sites predate 3000 B.P.; two sites are in shelters located in the coastal cliffs to the south of BBF and postdate 2000 B.P.(Fig. 5.2). Only sites which contained *in situ* assemblages were selected for excavation, no site was further than 1.5 km from the coast and all were located within a 1.5 km radius.

BBF is the first area on the southern Cape coast in which a number of Holocene sites in close proximity have been excavated thus allowing for a detailed inter-site comparative study. In accordance with Jarman *et al's* (1972) findings it seems possible that the extent of the area exploited by the sites inhabitants around BBF is unlikely to have exceeded a 2 hour walk or about 10 km. If correct, this approach allows for a direct comparison of different site types and locations and provides an opportunity to examine changes in subsistence strategies and cultural patterning, both spatially and temporally, given that the extent of the area exploited was likely to be similar in all cases. It is of course important to also take into account the likely effects of environmental change in such a study (Stothert *et al* 2003; Gamble *et al* 2004). One of the disadvantages of comparing sites which are spatially linked is that the time gap between occupations, for example at BBF, may be over 1000 years. This means that inter-site temporal comparisons can only be made in a general sense as we are unable to determine whether there was an hiatus in occupation in the interim periods, or whether we were simply unable to locate these sites.

A major aim of the Blombosfontein project was specifically to investigate the diversity present among a suite of Holocene coastal sites which were located in close proximity to one another. Fundamental to this objective was a consideration of environmental factors which may have influenced or limited human choice as to the range of resources exploited, the location of sites and the activities represented at each site. An integral part of the project was to excavate sufficient sites, within the time available, which could demonstrate the degree of diversity within the BBF area. The area and extent of each excavation was carefully planned to collect as wide a representation of the assemblage as was possible. Shellfish were ubiquitous at all sites and were regarded as one of the key factors in examining subsistence strategies over time but also in determining seasonality through the application of oxygen isotope analysis to shell carbonates. Cultural artefacts, in particular stone tools, provided vital clues in tracing cultural change and allowed comparisons to be made with excavated sequences from other sites in the southern Cape and further afield. A further key aim of the BBF project was to compare assemblages which fell within the pre- and post-2000 B.P. period, and to determine, first, whether the arrival of the first herders at the Cape could be detected in the later assemblages and second. what effects, if any, the arrival of the first herders at the Cape had on hunter gatherers in the BBF region. Careful consideration was given to the possibility of identifying units, in the younger excavated sites, which may have represented occupations by pastoralists.

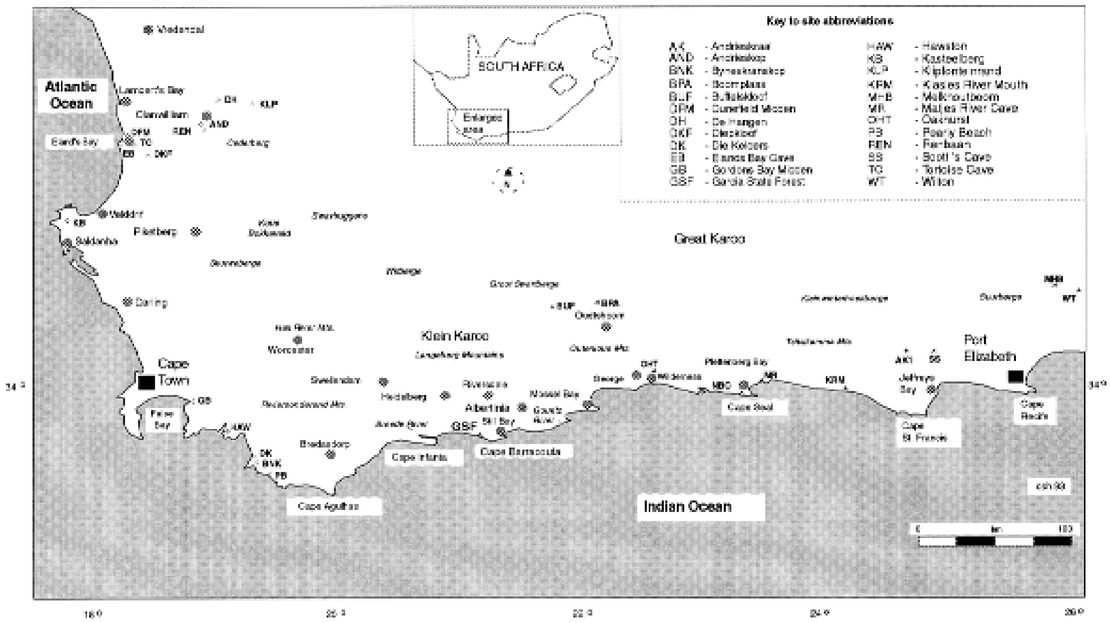


Fig. 1.1: Location of archaeological sites: southern Cape Province, South Africa

CHAPTER 2

ENVIRONMENT AND PALAEOENVIRONMENT

The point is that we simply cannot assume that Holocene environments in South Africa were unchanging or identical. Instead we must allow that the environment was a variable parameter in any model of Later Stone Age economy or ecology (Butzer 1974:37)

2.1: Introduction

Most hunter gatherers, worldwide, are known to move their camps, often seasonally, to make optimal use of a variety of resources within their territorial range (e.g. Lee 1968; 1984; Marshall 1976; Tanaka 1976; Draper 1977; Meehan 1982; Parkington 1977a,b, 2001; Lee 2006). The size and content of the excavated sites at BBF suggests that these sites were occupied for relatively short periods, and that the BBF area may have formed only a part of a larger subsistence strategy. Based on the limited evidence from the BBF sites we cannot even be sure that any of the inhabitants utilised the area more than once. Setting up camp at BBF may have been an opportune decision taken *en route* to another location, or it may have been specifically targeted for its known resources. In either event it is likely that prehistoric visitors to BBF also had a knowledge of the resources which were currently available in the surrounding Cape coastal plain, the inter-montane Cape Folded Belt regions, and even beyond into the Karoo.

However, the landscape of the Riversdale Plain, coast and inter-montane region was not static during the Holocene. Climatic variations affected wind, rainfall and temperature patterns (Cohen & Tyson 1995) and this, in turn, caused changes in the distribution of vegetation and fauna. Higher and lower sea levels covered or exposed sections of the coastal peneplain and affected the location and nature of the shoreline. Variations in ocean temperature provided optimum conditions, at different times, for a diverse range of marine organisms.

An understanding of ecological variation during the Holocene is essential in order to interpret at least some of the differences observed in the excavated assemblages at BBF . Those aspects of the environment which were subject to change are discussed in this chapter. A review of the modern physiography of the region (Section 2.2) and the geology of the Riversdale Plain (Section 2.3) provides an introduction to the physical features of the landscape. The formation of calcretes and the activation and stabilisation of the BBF dunefield were ongoing processes during the occupation of the BBF sites and the latter aspect may have influenced the surrounding vegetation and consequently the choice of location of a campsite.

Shellfish are ubiquitous at all the BBF sites indicating that the opportunities for gathering marine molluscs were apparently available for most of the Mid- to Later Holocene period. Table Mountain Sandstone (TMS) outcrops occur directly below BBF and provide ideal conditions for the establishment of colonies of shellfish. The extent and depth of the TMS outcrops, as well as the formation of beaches in sigmoidal bays, is discussed in the section on bathymetry of the Agulhas Bank (Section 2.4). Changes in sea levels can impact significantly on the availability of shallow marine resources, but the extent of the impact may depend on the offshore bathymetry (Shackleton 1988). Various sea level stands for the Holocene are predicted in Section 2.5 and the possible effects of these changes on the availability of shallow marine organisms discussed.

Present climate of the Riversdale region, palaeoclimatic models and the affect of coastal ocean temperatures on terrestrial climate and rainfall are presented in Section 2.6. A palaeoclimatic synthesis for the Holocene shows variations in rainfall and temperature affected the ratios of grassland to forest taxa in the southern Cape.

Fynbos has been the dominant vegetation type in the southern Cape during the Holocene. The possible impact of changes in the vegetation for the animals and people in the region are discussed in Section 2.7. A gradual change from grassland, to forest and scrub, during the Early Holocene resulted in an increase in browsing animals and a decrease in grazers in the southern Cape. These changes are reflected in the faunal assemblages from a number of Cape sites. More than fifty species of large mammals were recorded historically in the Cape ecozone but by the Late Holocene the numbers and distribution of these animals had been affected by human predation, the impact of domestic animals, and by deliberate burning of the veld *(cf.* Section 2.8).

2.2: Physiography

Blombosfontein Nature Reserve (BBF) is a small coastal nature reserve of approximately 350 hectares (Fig. 1.1, 5.1, 5.2). situated on the extreme southern end of a coastal foreland at 34º 25' S and 21º 13' E (see topo-cadastral 1:50 000 map 3421 AC Vermaaklikheid). Directly adjacent and on the seaward side is Blombos Nature Reserve (Erf Blomboschfontein 495/57). Unconsolidated dune sands, calcrete hardpans and calcarenites form the exposed surfaces in the reserve. Once a sparsely vegetated, active dune field the BBF land surface has now been stabilised as a result of a re-forestation programme suggested in the 1930s (Laver 1936) and started in the 1960s. The average elevation of BBF is around 150 m a.s.l.; the highest point, Vlakrant, is 167 m a.s.l. and the lowest point, to the west, is 90 m a.s.l. To the north the reserve is bordered by dense scrub and arable land, mostly used to graze cattle. Steep, wave cut and eroded coastal cliffs composed of calcarenites, calcretes and Table Mountain Sandstone form the southern boundary.

Originally, Blombosfontein formed a part of the Blomboschfontein land grant made to Hendrik van de Graaff in 1808 by the Earl of Caledon. It is now under the control of Cape Nature, a provincial nature conservation body (previously known as the Western Cape Nature Conservation Board). Riversdale is the closest major town situated 38 km to the north. Still Bay, a coastal village, located at the mouth of the Goukou River lies 19 km to the north-east. The Duivenhoks River mouth and nearby village of Vermaaklikheid is situated 19 km to the north-west (Fig. 5.1). Cape Town is 250 km due west (Fig. 1.1).

The southern Cape physiographic region includes three distinct elements: the Cape Folded Belt mountains, the Coastal Foreland and the Great Karoo Basin, which lies between the Folded Belt and the South African Plateau. BBF is located on a coastal foreland, here named the Riversdale Plain, which extends 40 km inland and lies mostly below the 300 m contour line. This section of the southern Cape coastal plain is naturally bound by the perennial Goukou and Duivenhoks rivers. To the north the Riversdale plain is bordered by the Langeberg mountains, a part of the Cape Folded Belt mountain range (Fig. 5.1). Perdeberg at 1340 m is the highest peak. Beyond the 15 km wide Langeberg lies the Little Karoo (Klein Karoo).

2.3: Geology of the Riversdale Plain

Bedrock Topography

Between Cape Agulhas and Mossel Bay, Palaeozoic deposits comprise a basement of folded and faulted sediments of the Cape Supergroup. Table Mountain Group sandstones dipping in a southerly direction outcrop on the coast between Odendaals Point and Still Bay. These are on the southern limb of an overturned syncline and are succeeded by Bokkeveld shales a short distance north of the coast. Contact between the Table Mountain Group and Bokkeveld shales is consistently in a west-south-west direction. Table Mountain Group sandstones re-occur in the anticline of the Langeberg to the north of Riversdale. An east-west downfault in the Palaeozoic sediments occurs at around 26 km from the coast on the Riversdale Plain and sediments of the Enon Formation fill the graben. The Enon and Cape Supergroup sediments are truncated by a marine peneplain (Deacon *et al* 1992; Rogers 1984,1988; Johnson *et al* 2005).

Generally the bedrock is surf-cut to form a smooth, and in places stepped, surface plain that dips seawards by approximately 6 m per km (Whittingham 1971; Marker 1986). Echograms show that while the Bokkeveld shales are easily plained to a relatively smooth surface, sandstones of the Table Mountain Group may produce highly irregular topography and major bedrock depressions (Rogers 1984, 1988; Johnson *et al* 2005).

Lithostratigraphy

A suite of Cenozoic sediments, known as the Bredasdorp Group, overly the marine peneplain and extend for approximately 15 km inland. These facies record a number of changes in sea levels in this area and reflect the variations in the volumes of sea water locked up in the ice caps during glacial and inter-glacial periods (Leroux 1989; Deacon *et al* 1992; Lambeck & Chappell 2001; Mastronuzzia *et al* 2005). The Bredasdorp Group consists of a succession of limestones, sandy limestones, sandstones and conglomerates and can be divided into six different formations (Table 2.1) (Ellis 1973; Malan 1986; Rogers 1984, 1988; Wickens (pers.comm); Leroux 1989; Johnson *et al* 2005). (classification of the Cenozoic sequence by Schloms *et al* (1983) has divided the calcareous, chiefly aeolian deposits into three sets ranging from A3 (oldest) to A1 (youngest).

Outliers of iron stained, quartzose sands of the Knysna Formation which overly bedrock are exposed at a number of locations on the Riversdale Plain (Thwaites & Jacobs 1987). Red sandy rock was recovered from two boreholes at a depth of around 30 m at Blombos (Whittingham 1971), and at Jongensfontein and Still Bay red sandstone is visible beneath the overlying aeolianite and calcarenite (Whittingham 1971; Rogers 1984).

In many places the De Hoop Vlei Formation lies directly on bedrock and forms the base unit of the calcrete-capped calcareous A3 type sediments (Malan 1986; Rogers 1984; Schloms *et al* 1983; Johnson 2005). A 3.3 m thick sequence overlying Bokkeveld shale is exposed near to Still Bay. The Mio/Pliocene De Hoop Vlei Formation is characterised by a shelly conglomerate layer, low-angle marine sands and bioturbated glauconite sand. A feature of this sequence is rare sharks teeth.

The Wankoe Formation is an aeolian facies of Mio/Pliocene age which volumetrically comprises the bulk of the Bredasdorp Group and may be up to 300 m thick in places. It is typified by regressional coastal calcarenite dunes made up of broken shelly material and well rounded quartz grains with glauconite visible in the cross-bedded aeolianite. Advanced pedogenesis of this A3 sub-unit produces the *terra rossa* soils which are widely exposed on the Riversdale Plain, particularly on dissected slopes and in gorges. To the west of Still Bay the distinctive and well grassed slopes of *terra rossa* soils form the foundation of small farming units (Ellis 1973).

Sediments of the younger Rooikrans Formation, termed A2 by Schloms *et al* (1983), are comprised of a basal pebble layer and an overlying shelly quartzose sand and are of Late Pleistocene age, possibly around 125,000 years old. Vegetated and semi-consolidated dune sands which form a narrow band along the Riversdale Plain coastline form the Waenhuiskrans Formation. These aeolianites are attributed to increased aeolian activity during the Late Pleistocene transgression about 20,000 years ago when the coastline was situated at the present 130 m isobath on the Agulhas Bank. Outcrops may be up to 60 m thick.

Partially-vegetated unconsolidated dunes, often mobile, mappable as A1 sediments (Schloms *et al* 1983), occur on the coast at Witsands, near the Duiwenhoks River, at Blombosfontein Nature Reserveand at Jongensfontein and Still Bay. Mapped as A1 sediments (Schloms *et al* 1983) these Holocene coastal dunes have been designated as the Witzand Formation (Rogers 1984; Johnson *et al* 2005).

Formation	Description	Age
Witzand (A1)	Unconsolidated wind-blown dunes	Holocene
Waenhuiskrans (A1)	Semi-consolidated aeolianite	Pleistocene
Rooikrans (A2)	Shelly quartzose sand and conglomerate	Pleistocene
Wankoe (A3)	Consolidated aeolianite	Mio/Pliocene
De Hoopvlei (A3)	Shelly quartzose sand and oyster-bearing conglomerate	Mio/Pliocene

Table 2.1: Geological sequence of the Bredasdorp Group Cenozoic sediments (after Rogers 1984; Malan 1986; Johnson et al 2005)

Calcretes

Older calcretes and calcarenites of the Bredasdorp Formation underlie most of the aeolianites of the Holocene Witzand Formation at BBF and elsewhere in the southern Cape (Bateman *et al* 2004). At the seaward edge of the reserve, areas of separate depositional facies of calcrete are exposed on the cliff tops. In places these calcrete layers are up to 20 m thick. Similar thick calcrete capped deposits are recorded at Rooikrans east of Still Bay, and their formation is attributed to strong winds during the Late Pleistocene (Rogers 1984). Mobile coastal dunes also overly calcretes at Melkbos, near Cape Town (Netterberg 1974a) at Elands Bay and elsehere in the south western Cape (Butzer 1979, 2004), and at Swartklip (Netterberg 1974a; Barwis & Tankard 1983).

Calcretes are formed by the mobilisation of calcium carbonates from overlying calcareous or beach sand during alternating wet-dry-wet conditions (Bateman *et al* 2004). They represent a period of slow deposition and stability of the overlying soils. In some cases, for example at Sambio in Namibia, hardpan calcretes may provide the parent material for the overlying calcrete (Netterberg 1974b). The formation of hardpan calcretes, exposed in some areas at BBF, are generally associated with periods of rainfall below 550 mm and may also relate to a period of change from wet to dry (Netterberg 1974b). Climatic conditions strongly influence the physical and chemical composition of calcrete. However, the exact processes of calcrete formation are imperfectly understood and palaeoclimatic information derived from calcretes should be treated with caution (Deacon & Lancaster 1988).

At Swartklip the deposition of the last facies of calcrete may date to the start of the Last Glacial when sea levels dropped and atmospheric circulation was more intense (Barwis & Tankard 1983;

Hendey & Volman 1986). It is not clear when the upper layers of the hardpan calcretes at BBF were formed, although a Late Pleistocene/ Early Holocene date is not unlikely. Calcrete formation is an ongoing process at BBF and at two sites the archaeological deposits are surrounded by a heavily brecciated matrix.

Coastal Dunes: Activation and Stabilisation

An aerial photograph of BBF taken in 1954 shows unvegetated mobile dune fields covering the whole reserve. In the 1960s an extensive fynbos planting programme, as a result of earlier recommendations (Laver 1936), was undertaken by the Department of Forestry to stabilise the dune field. An aerial photograph of the same area taken in 1983 shows vegetation extending over most of the reserve.

Admiralty charts for 1860, 1867 and 1869 show no evidence of extensive stretches of open sand along the Riversdale coast, although surveys carried out at the time did not note minor details and existing dune fields may not have been recorded. Heese (n.d.) reports that as recently as 1917 extensive and dense forest covered the coastal tract from Still Bay to BBF. In order to get rid of marauding predators, including leopards, local farmers set fire to the forest causing destabilisation of the dunes. However, denudation and re-activation of the BBF dune fields may have started at least 130 years ago due to a combination of trampling, veld burning and overgrazing (Walsh 1968; also see Novellie 1987). Cattle were brought to the coast from the acidic soils further inland to graze on the alkaline dune fields. The coastline between BBF and Still Bay was particularly attractive for this purpose as, at the interface of the basal TMS and overlying Bredasdorp Group Limestones, perennial fresh water springs could be found above the high water mark. The general absence of fresh water away from the main rivers of the Riversdale Plain meant that in order to utilise the coastal dunes for grazing, cattle had to be watered at the coastal springs every second day. By 1960 there were 3500 acres of major drift-sands in the area between Still Bay and BBF (Heese n.d.; Walsh 1968).

The aeolianite facies of the Holocene Witzand Formation at BBF shows episodes of dune stabilisation alternating with renewed aeolian activity. Some palaeoenvironmental reconstruction is possible by associating the geo-stratigraphy of BBF sites with the radiocarbon dates obtained from these sites.(c.f. Ch. 5).

A major accumulation of aeolian sands and dune ridges took place in the southern Cape some time during the -130 m sea levels of the Last Glacial (Butzer & Helgren 1972; Bateman *et al* 2004; Carr *et al* 2006, 2007a,b). Coastal dune formation is a function of a plentiful supply of sand and close proximity to beaches (Walsh 1968; Deacon & Lancaster 1988; Butzer 2004; Bateman *et al* 2004).

Renewed accumulation of dune ridges in the Late Pleistocene and early Holocene was probably a response to a massive input of fluvial and aeolian deposits exposed during the Last Glacial transgression (Dingle & Rogers 1972; Bateman *et al* 2004; Carr *et al* 2006, 2007a,b). The dominant winds causing the deposition of dunes at Robberg during the Late Pleistocene were from the south-east and south-west. Strong winds in this area now come from the west and north-west, suggesting changes in storm winds since the Pleistocene (Deacon & Lancaster 1988).

Blombos Beach, stretching 15 km in a west-north-west direction, is the modern source of the aeolianites at BBF. The mean axial alignment of the dunes at BBF is in a north-south direction and at right angles to the coast. Prevailing winds determine dune alignment but other factors such as natural barriers, vegetation and wind deflection cause variations in the alignment of major dunes and also cause continual realignment of the axes of the lesser interior dunes (Roberts *et al* 2008). At Cape Agulhas, west of BBF, the greatest sand displacement for the summer months (September - April) of 1940-43 was caused by westerly and easterly winds and in winter by westerly winds (Walsh 1968). At Cape Agulhas the westerly wind is the main rain-bearing wind but, being very stormy, can cause considerable sand movement prior to the main rainfall periods in spring and autumn. A westerly wind striking the coast to the west of BBF would be partly deflected by the coastal cliffs above Blombos Beach. Beach aeolianites carried by the wind are then funnelled upwards at the eastern end of the beach thereby feeding the BBF dune fields. Periods of lowered sea level may have led to increased aeolian activity and coastal dune instability (Carr *et al* 2006, 2007a,b). Contrary to this argument Faure *et al* (2002:47) propose that during low sea level stands in Africa fresh water would flow onto emerging shelves. As the ocean regressed the gradient of the coastal water Table increased and concomitantly amplified the hydrostatic head on groundwater aquifers inland. On the Agulhas shelf up to 120 m of hydrostatic pressure would have been released resulting in an enhanced flow of groundwater to the coast. In their 'coastal oasis' model Faure *et al* (2002:54) suggest the perennial fresh water supply to the exposed coast resulted in a rapid colonisation of vegetation and terrestrial animals, including humans. Following this model the volume of sand available for dune formation during periods of marine regression would thus be minimised (also see Barwis & Tankard 1983; Illenberger 1996). Significant aeolian deposition in the southern Cape after the MIS 5e high stand when sea levels were rapidly changing (Hearty *et al* 2007) suggests that aeolian sedimentation follows interglacials and is not necessarily a function of exposed shelves. Aeolianite deposition at the MIS 5/4 boundary and into the MIS 4 interstadial follows this pattern signifying conditions in the southern Cape at the transition were wetter and cooler (Bateman *et al* 2004). High sea levels during the Mid-Holocene may have resulted in periods of dune stabilisation, increased vegetation cover and the formation of humic palaeosols and valley peat floors although the possibility of dune formation during high sea levels clearly cannot be ruled out.

Similar areas of unconsolidated sands and weathered aeolianites are widespread in the Cape coastal areas (Bateman *et al* 2004; Roberts *et al* 2008). In the Wilderness area, to the east of BBF, Butzer & Helgren (1972) distinguished at least six generations of aeolianites based on palaeosol stratigraphy, and Martin (1968) recognised four successive aeolian dune belts in the same region. Based on geomorphological and palynological data from the Wilderness Lakes area, Butzer (1974, 2004) records episodes of dune stabilisation, pedogenesis and local peat accumulation during the Holocene (also see Bateman *et al* 2004). The first period of dune stabilisation with attendant pedogenesis at about 8000 B.P. is followed by renewed aeolian activity and inland soil erosion from 7000 - 4200 B.P. Humic soils and valley peat floors develop until about 1000 B.P. followed by another phase of gullying and aggradation. After 200 B.P. Butzer (1974) reports renewed gullying with dune re-activation. Palaeosols mapped on the Robberg Peninsula by Butzer & Helgren (1972) also indicate a period of dune stabilisation prior to 7030 B.P. Renewed sand mobilisation occurs from 7000 B.P., followed by stabilisation and peat formation during the period 4850 - 1300 B.P. and again at 500 B.P. (also see Carr *et al* 2006). The Mid-Holocene period of stabilisation, increased vegetation cover and higher precipitation would have coincided with a +2 m sea level (Butzer & Helgren 1972). At Nelson Bay Cave, Butzer (1984a, b, 2004) notes a strong input of aeolian dune sands at 5500 B.P. but minimal sedimentation after 4000 B.P. Renewed deposition of dry shelly sands is also reported from Die Kelders at around 6000 B.P. (Tankard 1976a).

Pedogenesis, peat accumulation and the development of humic soil horizons on aeolian sands are the result of a combination of reduced sediment supply and/or increased vegetation cover (Butzer & Helgren 1972; Butzer 1984a, b, 2004; Bateman *et al* 2004). Specific climatic conditions may be reflected by the degree and type of pedogenesis. Increased precipitation is also likely to contribute to humic palaeosol formation although Deacon & Lancaster (1988) point out that even without an increase in precipitation, vegetation may develop on dunes as a result of a regressing shoreline (Faure *et al* 2002).

Incised Rivers: The Goukou and Duivenhoks Rivers.

The Goukou and Duiwenhoks Rivers, respectively 54 km and 48 km in length, border the Riversdale Plain to the east and west. Both rivers originate in the Langeberg Mountains of the Cape Folded Belt and from here cut through a peneplain plateau at 100 - 300 m which slopes to the coast.

Both the Goukou and Duiwenhoks rivers cut through highly erodible Cretaceous sedimentary rocks of the Enon Formation. For the next 40 km and 20 km, respectively, the rivers flow over Bokkeveld shale. The surroundings at the mouth of the Goukou River are aeolianites and coastal sands with some outcrops of Table Mountain sandstone. From Vermaaklikheid, the Duiwenhoks River cuts through 7 km of Bredasdorp Formation calcarenite overlain by Quaternary sands to emerge at the coast. Both the Goukou and Duivenhoks estuaries are permanently open with constricted tidal inlets and have a tidal reach of 19 km and 14 km respectively (Carter & Brownlie 1990).

After the Late Pliocene uplift the surfaces above the marine peneplain were incised by the two rivers. The degree and intensity of erosion of the river valleys would have increased during the Late Pleistocene (Marker 1986; Rogers 1984, 1988; Johnson *et al* 2005). The cooler world climate at the time inhibited the hydrological cycle but also caused less evaporation and any rainfall would have more effectively eroded the landscape. Seismic surveys of the continental shelf show that as a result of the Holocene transgression the lower reaches of the two rivers were drowned (Friedinger 1985; Rogers 1984). It is possible that the extent of the marine estuaries at the present mouths of the Goukou and Duivenhoks Rivers may have been substantially greater during the Mid-Holocene (Rogers 1984, 1988).

2.4: Bathymetry of the Agulhas Bank

Resistant outcrops of the Cape Supergroup quartzites have led to the formation of a series of eastwards facing sigmoidal bays along the southern Cape coast (Deacon & Lancaster 1988; Johnson *et al* 2005). The continental shelf, known as the Agulhas Bank, begins as a relatively shallow topographical feature south of Port Elizabeth and extends to the south and west beyond Cape Agulhas. At its widest point, south of Cape Infanta, the Agulhas Bank extends more than 200 km and at Cape Barracouta the edge of the continental shelf is around 100 km to the south (van Andel 1989; Bateman *et al* 2004; Carr *et al* 2006, 2007a,b; Roberts *et al* 2008).

The bathymetry of the Agulhas Bank between the Duivenhoks and Goukou Rivers is characterised by three major zones: Table Mountain Group outcrops form a narrow shelf 4 - 15 km wide, the base of which lies at a depth of 20 - 80 m; to the west of Cape Barracouta, and farther offshore, the middle shelf is smooth and lies at a depth of between 60 - 100m; the middle shelf is underlain by south to south-east dipping Cretaceous strata covered by unconsolidated sediment; on the middle shelf east of Cape Barracouta outcropping Tertiary rocks are responsible for less regular isobaths (Friedinger 1985:143; van Andel 1989; Bateman *et al* 2004).

2.5: Sea level Changes

The effects of changing sea levels can have a significant impact on the availability of shallow marine resources (Yates *et al* 1986; Jerardino 1993; Henshilwood *et al* 2001) and the responses of hunter-gatherers to these environmental changes are global issues in the study of coastal prehistory.

Examples include Australia (Lourandos *et al* n.d.; Kershaw *et al* 2006), south-eastern United States (Claassen 1986; Morey & Crothers 1998), parts of Western Europe (Bailey & Parkington 1988; Lubell *et al* 2007) and East and South Africa (Klein 1973, Avery, G. 1975, Yates *et al* 1986; Parkington *et al* 1988, van Andel 1989, Jerardino 1993, 1998, 2003; Breen & Lane 2003; Sealy *et al* 2004).

During the Last Glacial Maximum, between ca. 20000 and 17000 B.P., sea levels on the southern Cape coast were between -100 m and -165 m (Dingle & Rogers 1972; Shackleton 1977; Cronin 1982; van Andel 1989; Bateman *et al* 2004; Carr *et al* 2006). As the sea regressed a coastal plain more than 100 km wide was exposed to the south of BBF (van Andel 1989; Carr *et al* 2006).

Increasing evidence provides clues to the post-glacial recovery of sea level (Ramsay & Cooper 2002). Most authors have assumed a more or less steady rise from the Late Pleistocene until the Mid-Holocene when sea levels were similar to the present. The general rise curve rests on data selected for stability from Bloom (1977) and takes account of the recently established two-step course of northern hemisphere deglaciation (Ruddiman & Duplessy 1985).

Although Tankard (1976b) could find no evidence for higher Holocene sea levels on the western Cape coast there is firmly dated evidence from KwaZulu Natal which suggests a mid-Holocene sea level c. 2.75 – 3.5 m above present (Ramsay & Cooper 2002). A +2-3 m sea level is reported from Langebaan Lagoon at between 6500 and 5000 B.P. (Birch 1976; Flemming 1977; Miller *et al* 1993; Compton 2001). A raised cobble beach at 2.8 m above present sea levels at the Verlorenvlei mouth is dated at 3820 B.P. (Yates *et al* 1986).

Based on an analysis of shellfish remains and certain types of marine sediments present in the archaeological deposit at Tortoise Cave on the Cape West coast, Jerardino (1993) suggests a series of transgressions and regressions occurred during the Mid- to Late Holocene. A +2 - 3 m sea level is indicated at 6000 B.P. followed by a rapid regression to present sea level by 4200 B.P.; a further 2 m transgression until 3800 B.P. and modern sea levels by ca. 3500 B.P. A small but temporary rise may have occurred at around 1800 B.P. (Jerardino 1993).

A raised gravel beach on the southern Cape coast near the Gouritz River is interpreted by Rogers (1988) as a storm beach associated with a Holocene sea level high of +2 - 3 m dating to between 3000 - 2000 B.P. A Mid to Late Holocene high sea level of +1.5 m based on diatom analysis from Groenvlei near Wilderness is dated at between 6870 B.P. and 1905 B.P. (Martin 1968).

Evidence for a shore at this elevation on the southern Cape coast has also been cited (Martin 1962; Maud 1968; Butzer and Helgren 1972; Singer and Wymer 1982; Ramsay & Cooper 2002; Carr *et al* 2006). Evidence for a tectonic origin for higher sea levels is ruled out and evidence presented by

Clark and Lingle (1979) suggests that isostatic compensation was responsible for the Holocene high sea stand in some regions, including southern Africa.

Available sea level data suggest that during the early Holocene the sea was less than 1 km from the present coastline at BBF and at its current elevation by Mid-Holocene (van Andel pers. comm.). The impact of a predicted +2 m sea level (Lambeck pers. comm.) rise on the 120 m high coastal cliffs to the south of BBF may have been minimal, although wave erosion of calcarenites at the cliff base is evident. A raised cobble beach below BBC at Skuinsbaai may be a relic of a previous Holocene sea level higher than at present. Although some of the presently exposed TMS outcrop to the south of BBF would have been inundated by a +2 m transgression, a considerable portion of the rocky coast would still have been exposed during low tides and the impact on shallow marine resources would have been minimal. The quantity and variety of shellfish recovered from the middens at BBF dating to between ca. 6000 B.P. and 500 B.P. supports this hypothesis. The impact of a higher sea level on the sandy Blombos Beach, situated to the west of Cape Barracouta, may have caused extensive erosion of the littoral dune margin above the beach. Scouring of sections of the beach down to bedrock level may also have occurred, as is evidenced at present during high seas caused by winter storms.

2.6: Climate and Palaeoclimate

Present Climate

Southern Africa, dominated by strongly seasonal precipitation and dry climates, lies almost entirely within the subtropical high pressure belt. The land mass of Africa divides this belt into two cells: the South Atlantic and Indian Ocean anticyclones causing a mean anticyclonic circulation above the atmospheric boundary layer throughout the year. These two anticyclonic cells are centred on 30º S with 5 - 6º of seasonal latitudinal movement. To the south of the subcontinent lie the circumpolar westerlies and their associated temperature low pressure disturbances. As a result the climate in southern Africa is affected by the interaction of tropical and temperate circulations during all seasons (Deacon & Lancaster 1988; Barrable *et al* 2002; Bateman *et al* 2004).

The general anti-cyclonic nature of circulation patterns in southern Africa strongly influences the pattern of surface winds, those in coastal areas generally being stronger than inland areas. Strong winds, generally parallel to the coast, are a feature of the weather along the Cape coast. Atmospheric moisture content is highest in the east, as the major moisture source for most of southern Africa is the Indian Ocean. A gradient in moisture content from east to west is especially true in summer and is evidenced by pan evaporation rates being least along the southern Cape coast (Deacon & Lancaster 1988; Cohen 1993; Bateman *et al* 2004).

The Riversdale Plain is classified as Climatic Region A (Schulze 1965) and receives rain almost equally in all seasons with peaks in spring and autumn. The orographic effects of the Cape Folded Mountains leads to higher precipitation in the intermontane regions than at the coast. The mean annual precipitation (MAP) for the Goukou River Catchment is 482 mm and 634 mm for the upper catchment area. In the Duivenhoks River Catchment the MAP is 480 mm, and 750 mm in the upper catchment (Carter & Brownlie 1990). The minimum and maximum MAP recorded at Still Bay for the period 1926 - 1950 was 380 mm and 470 mm (Walsh 1968), and the mean annual rainfall for 1980 - 1992 was 430 mm. During winter and spring the predominant winds are from the west and south-west and have an average daily strength of 54 km/h. Easterly and south-easterly winds predominate in the summer months with an average speed of 64,8 km/h but are less frequent than the winds of the winter months (Carter & Brownlie 1990; Rebelo *et al* 1991).

The average daily maximum temperatures are 22 ^{o}C in January and 16 ^{o}C in July. Extreme temperatures reach 42 ^{o}C and 32 ^{o}C respectively. Average daily minimum temperatures are about 15 ^{o}C in January and 7^{o} C in July. Occasional extremes of 4^{o} C are recorded in summer and -4 ^{o}C in winter. In winter and spring snow occasionally falls on the Langeberg Mountains. Frost rarely occurs and hail and thunderstorms are infrequent (Carter & Brownlie 1990; Rebelo *et al* 1991).

The Agulhas Current, the Agulhas Bank and Ocean Temperatures

Coastal ocean temperatures affect terrestrial climate and rainfall. Close to the edge of the continental shelf, the warm Agulhas current flows rapidly in a south-westerly direction and near the southern tip of Africa is retroflected back towards the south-west Indian Ocean. The Agulhas current usually has a minimal influence on the water temperature of the inshore waters of the southern Cape coast during summer although advective processes, such as intermittent summer upwelling, can have an effect (Cohen 1993; Bateman *et al* 2004). However, the Agulhas current can influence the coastal weather by being causative in establishing a sharp and areally extensive thermocline over the area in the summer months (Carr *et al* 2006). During winter, strong south-westerly winds may affect surface and sub-surface sea temperatures by forcing warm water plumes inshore (Cohen & Tyson 1995). Solar insolation is the major factor in determining intra-annual variability in sea surface temperatures (SST) on the Agulhas Bank (Cohen 1993; Cohen & Tyson 1995).

A strong correlation between phase changes of the southern ocillation and intra-annual SST's is also present. Anomalously high SST's during summer months are recorded during the low phase El Niño, and anomalously low summer SST's during the high phase La Nina. The effects of these phases on winter SST's are not necessarily synchronic (Cohen 1993).

Strong seasonal signals are evident in sea surface temperatures with an average amplitude of 5 °C for the period January 1972 - December, 1992, recorded at Still Bay. The highest SST's recorded during this period are consistently in the mid-summer months and the lowest SST's in mid-winter. Cohen (pers. comm.) measured the changes in the stable oxygen isotopes present in the carbonate of a modern *Scutellastra tabularis* shell collected at BBF. The results demonstrate that for the period January 1990 - January 1993 the average temperature range between mid-summer and mid-winter was 7.8 ° C.

Palaeoclimatic Models

Climatic conditions during the Holocene in southern Africa have been reconstructed from a range of evidence including: pollen (Martin 1968; Avery 1982a; Scholtz 1986; Scott 1984, 2002; Baxter 1996); micromammals (Avery 1982a, b, 1995; A.I. Thackeray 1989, 1992) charcoal and botanical studies (van Zinderen Bakker 1982; Deacon *et al* 1983; Prior & Price Williams 1985; Scholtz 1986; Tusenius 1989; February 1992; Cowling *et al* 1999; Parkington *et al* 2000); terrestrial fauna (Klein 1973, 1975, 1980, 1984); geomorphology (Butzer & Helgren 1972; Tankard 1976a; Helgren & Butzer 1977; Butzer 1974, 1984a, b, 2004; Illenberger 1996; Bateman *et al* 2004; Carr *et al* 2007a,b); and ocean based models (Cohen & Branch 1992; Compton 2001; Ramsay & Cooper 2002). Most of the models predict past temperature and/or precipitation changes suggesting a link between the two variables. Palynological evidence, suggests that changes in temperature and precipitation were not necessarily in harmony, particularly during the Mid-Holocene *(cf.* Cohen 1993; Baxter 1996) . However, Cockroft *et al* (1987) and Tyson & Lindsay (1992) imply that cooler periods are generally drier and that wet conditions relate to periods of global warming. A summary of the available data and a suggested reconstruction of the Holocene climate in southern Africa is discussed, for example in Deacon & Lancaster (1988), Tyson (1986), Cohen (1993) and Cohen & Tyson (1992), Avery (1995), Baxter (1996), Cowling *et al* (1999), Barrable *et al* (2002), Ramsay & Cooper (2002), Butzer (2004), Bateman *et al* (2004), Carr *et al* (2006, 2007a,b), Chase & Meadows (2007), Chase & Thomas (2007)..

Temperatures in the southern Cape during the Holocene have been markedly warmer than at any other time during the last 100,000 years. Deacon & Lancaster (1988:157) point out that the scale of change in terms of fluctuations in temperature and humidity during the Holocene was considerably lower than that of the glacial and inter-glacial modes of the Late Pleistocene and Holocene. Temperature changes for the Holocene, calculated from multivariate analyses of micromammal species (Thackeray 1987, 1992) and from the oxygen isotope contents of a Cango speleothem, show fluctuations of less than 1° C around the present day mean, although in some areas variability may have been higher (Deacon & Lancaster 1988; Butzer 2004; Chase & Meadows 2007a; Chase & Thomas 2007).

A synthesis of the available palaeoclimatic evidence suggests that some broad, time-related patterns can be charted for the southern Cape climate during the Holocene.

Palaeoclimatic Synthesis

10,000 - 7,000 B.P.

Increasingly warm temperatures are recorded with evidence for alternating cooler/warmer intervals at Byneskranskop and Boomplaas (Deacon, H.J. 1979; Deacon *et al* 1984). High sea surface temperatures in the Indian Ocean are recorded at about 10000 - 9000 B.P.(*cf.* Cohen 1993) and an early Holocene thermal rise is reported in isotope data from Antarctic deep-ice cores between 10000 - 7500 B.P. (*cf.* Cohen 1993). Precipitation estimates for the Cape suggest generally dry conditions (Deacon & Lancaster 1988).

7,000 - 4,000 B.P.

A synthesis of palaeoclimatic data for this period by Cockroft *et al* (1987), Deacon and Lancaster (1988) and Tyson & Lindsay (1992) indicates increasing summer rainfall and a decrease in winter rainfall. Higher air temperatures on the east and southern Cape coasts meant greater precipitation (Cohen & Tyson 1995).

Oxygen isotope analysis of *Scutellastra tabularis* shells from Nelson Bay Cave show that prior to 6300 B.P. summer and winter temperatures were lower on the coast than today. Between 6300 - 5300 B.P. the mean SST was 2 ^{o}C higher than at present. Higher SST's and greater precipitation than at present prevailed in the region until 3800 B.P. although there is some evidence for a cooling trend after 4300 B.P.(Cohen & Tyson 1995). However, Van Andel (pers. comm.) points out microclimatic changes, such as that recorded at Nelson Bay Cave, may only apply to a confined region, and some caution is therefore needed in extending observations from one region to another.

Pollen analyses from Groenvlei (Martin 1968), and a period of dune stabilisation at Beacon Island (Helgren & Butzer 1977), suggests that warm and moist conditions post-date 7000 B.P. in the all-year rainfall region of the southern Cape. Pollen analysis from Groenvlei shows an increase in forest taxa in the Mid-Holocene (Martin 1968). The presence of warm water diatoms from the same site (Martin 1968), and the evidence of warmer temperatures at Langebaan Lagoon on the west coast (Flemming 1977), may relate to higher Mid-Holocene sea levels and SST's.

4,000 - 0 B.P.

Oxygen isotope data from shells at Nelson Bay Cave show a mean decrease in SST of 1 ^{o}C after 3300 B.P. Colder sea temperatures, possibly associated with the start of a Little Ice Age, are also reported at 650 B.P. (Cohen & Tyson 1995). A lower incidence of forest taxa and a higher grass component in the Cape ecozone during the last 2000 years (Martin 1968; Scholtz 1986) suggests cooler conditions in the southern Cape. Optimum forest conditions in the southern Cape prevailed during the warm, moist period from around 6000 -2000 B.P. Thereafter, cool and wet conditions prevail along the southern and south-western Cape coast (Deacon & Lancaster 1988; Avery 1982a, 1983, 1995).

2.7: Vegetation

The vegetation of the Riversdale Plain (defined in this section as the area between the Duivenhoks River to the east, the Gouritz River to the west and the Langeberg Mountains to the north) has been described by Muir (1929), Acocks (1953; 1988) and Cowling *et al* (1997). The flowering plants in the region were surveyed by Bohnen (1986) and Cowling *et al* (1997), and veld plants suitable for grazing by Marais (1937) and van Breda & Barnard (1991). Despite these publications the Riversdale Plain remains one of the lesser studied regions in the Fynbos Biome (Rebelo *et al* 1991). An ecological survey of the Riversdale Plain plant communities has been undertaken by Rebelo *et al* (1991) and forms the basis for the resume below.

The term 'fynbos' requires some clarification as it is used in the context of a vegetation type, a biome and a flora. Dutch settlers first used the term *fijnbos* to describe the fine or small-leafed vegetation they encountered in the south-western Cape. Acocks (1953) introduced the term 'macchia' in an attempt to replace the parochial term 'fynbos' but the latter term is still widely used and now generally accepted in both scientific and popular literature (Cowling 1992:vii; Cowling *et al* 1997).

Within the Cape Floristic Region, fynbos is the dominant vegetation type and includes elements from two floras, five phytochoria and five biomes (Cowling 1992; Cowling *et al* 1997). Phytogeographically, the Riversdale Plain is a region distinct from that of the Langeberg Mountains and is unique in the Cape fynbos biome. The region contains the largest Enon deposits on the coast and the largest development of Tertiary Limestone in the Fynbos Biome. Within the 2800 square km of the Riversdale Plain, 1580 plant species have been recorded and 88% of the total Dune Fynbos found in the Cape occurs here; unique patches of Dune Scrub Forest patches are also present (Rebelo *et al* 1991).

Three major vegetation groups occur on the Riversdale Plain consisting of two non-fynbos groups (Forest and Thicket, and Karroid and Renoster Shrubland) and one Fynbos Group made up of four series: Grassy, Asteraceous, Restioid and Proteoid). The BBF environment, consisting of well drained calcareous sands on recent coastal dunes, supports a Dune Asteraceous Fynbos and differs from other Asteraceous Fynbos types due to its high cover of non-ericaceous ericoids and an absence of proteoids. Few Ericaceae are found but a high cover of Rutaceae and Restionaceae may be present. Dominant plant species include *Agathosma apiculata, Carpobrotus acinaciformis* and *Ischyrolepis eleocharis*. In the absence of fire, a critical factor in the life-cycle of fynbos regeneration, Dune Thicket replaces Dune Asteraceous communities especially in mesic areas. Dune Thicket typically now occurs on the northern and western boundary of BBF and is characterised by a high cover of fleshy-leafed shrubs, a high cover of non-proteoids mostly below 2 m and a low cover of succulents. Typical species of Dune Thicket are *Syderoxylon inerme, Canthium mundianum, Cassina peragua* and *Salvia africana-lutea.* Deep, organic-rich alkaline sands are preferred by Dune Thicket species but they may also be found on recent coarse dryish sands with lower organic levels, generally situated on the littoral fringe (Rebelo *et al* 1991; Cowling *et al* 1997).

In an attempt to stabilise the shifting aeolian dune field which characterised BBF during the first half of this century an extensive programme of stabilisation and re-planting of indigenous plant species was carried out by the Department of Forestry in the 1960s. During 1993 Richard Cowling collected samples of the woody plant species found within an approximate 20 km radius of BBF. A list of the species collected is presented in Table 2.2.

The present distribution of vegetation groups in the BBF area suggests there were periods of Dune Asteraceous Fynbos cover and Dune Thicket type vegetation during the Holocene. However when the shifting aeolian dunes were active, ground cover would have been minimal or absent. Vegetation during the Late Holocene is likely to have alternated between a light Dune Asteraceous Fynbos cover and unvegetated shifting dunes.

Lower sea levels after the Mid-Holocene high resulted in a wider expanse of beach to the west of BBF, with a concomitant increase in the amount of aeolian sand available to feed the dune field. After 2000 B.P. the BBF dune vegetation may have been utilised by Khoe herders to seasonally graze stock on the 'sweet' pasture of the alkaline dune sand, just as European settlers later grazed their stock on the dunes in the 18th and 19th C. (*cf.* Heese n.d.; Godee-Molsbergen 1916a,b; 1932; Blommaert & Wiid 1937). An extreme shortage of water on most of the Riversdale Plain meant the coastal dunes had to be crossed by stock to gain access to the fresh water springs found on the coast below BBF, thereby damaging a fragile ecosystem (Marais 1968). It is also likely that game animals used the same access route to the coastal spring water and grazed or browsed in the littoral dunes.

Vegetation may have been periodically burnt in the BBF area (*cf.* Heese n.d.) to encourage the growth of new shoots, a practice which was widespread among the Khoe and the Dutch settlers at the Cape (*cf.* Marais 1937: Avery, G. 1976; Wilson & Thompson 1969; Deacon, H.J. 1976; Smith 1986; Parkington 1991; Deacon & Deacon 1999). One or a combination of any of these actions is likely to have impacted considerably on the stability of the dune fynbos (Marais 1968). The effects of poor veld management in the littoral zones of the Cape, mainly due to fires and overgrazing this century are still evident (Marais 1937; Walsh 1968; Novellie 1987). The unstable, shifting aeolian dune field which constituted BBF in the 1950s may have persisted for much of the last 2000 years and highlights the fragility of this coastal environment. (Heese n.d.; Walsh 1968).

Changes in the vegetation cover at BBF during the Holocene may help explain the variation in the location of prehistoric campsites. Seven of the radiocarbon dated sites at BBF are older than 3000 years B.P. and all are situated within the dune area. Both the later sites, BBC and BBF 9, post-date 2000 B.P. and are situated in shelters immediately adjacent to the coast. BBC was repeatedly occupied between 290 B.P. and 1840 B.P., yet there is no evidence of the dunes being re-occupied after 2000 B.P. Palaeosols underlying the deposits of the dune sites provide useful pointers to past vegetation cover at BBF and the significance of these soil horizons is discussed in Chapter 5. A change from Dune Thicket type vegetation to Dune Asteraceous Fynbos cover on the BBF dunes would have led to a reduction or absence of milkwood (*Syderoxylon inerme*) within the dunefield. Milkwood is a shrub which grows several metres in height and forms an extensive and dense canopy. Natural hollows form under these milkwood canopies and make excellent camping spots offering protection from the elements. A link between the location of coastal shell middens and clumps of milkwood (*melkbosch*) was suggested by Martin (1872:55).

> I have often been surprised when walking round the coast to come upon heaped-up mounds of fresh-looking shells, in very bare parts. I now find that where the mounds are there was a dense clump of *melkbosch* - a bush so close, that as all know who ever camped out at Cometjie, is almost as good a shelter as a house. The bush has long been cut down and burnt, but its roots can be found running down under the shells. These mounds were kitchen-middens, without doubt; and the conditions attending their situation invariably are, shelter, which the bush would give, suitability of sea-shore for successful fishing and a fresh-water spring near by.

Only a limited number of milkwood trees now grow in the dunes at BBF but fossilised root-casts, tentatively identified as those of milkwood (Cowling pers. comm.), are evident in the locality of five sites, BBF 1, BBF 2, BBF 3, BBF 4 and BBF 5. As the root-casts have not been radiocarbon dated they cannot be positively correlated with the times these sites were occupied. However, it is reasonable to argue that the location of the sites related to the protection afforded by suitable vegetation and that stands of milkwood made the dunes an attractive area for habitation. At the Gordon's Bay shell midden, dated to around 3000 B.P., carbonised milkwood seeds were recovered in Layers 1 and 3, although milkwood is now rare in the vicinity of the site (van Noten 1974).

Ethnographic and ethnohistoric records indicate that a wide range of plants were used by indigenous people for food, raw materials and medicines (van Wyk *et al* 1997; van Wyk & Gericke 2000). The importance of plants as food resources for prehistoric people in the Cape can be traced back to the Middle Stone Age. Plant materials dating to the Late Pleistocene are preserved in human occupation layers at Klasies River mouth and Boomplaas (Deacon, H.J. 1978, 1979; Deacon & Deacon 1999) and at Eland's Bay Cave (Cowling *et al* 1999; Parkington *et al* 2000). Geophytes - plants with underground tubers, corms or bulbs - reflect the best collecting opportunities as they offer higher kilojoule returns than any stems, leaves or inflorescences (Parkington 1991; Deacon, H.J. 1992; van Wyk & Gericke 2000). Well preserved plant remains have been recovered from a number of Holocene sites in the southern Cape, most notably at Scott's Cave (Wells 1965), Melkhoutboom and Highlands Rock Shelter (Deacon H.J. 1976; Deacon & Deacon 1999; Mitchell 2002) suggesting that plant foods were being systematically collected by people throughout the Holocene as food, but also for a variety of other uses. The most common geophytes at these sites are *Watsonia, Hypoxis, Cyperus usitatus* and the rootstock *Bulbine alooides*. A key factor in the seasonal movement model of hunter gatherers between the coast and the interior during the Holocene is the inland availability of corm bearing plants during the summer months, followed by a reliance on coastal resources during winter (Wells 1965; Avery 1974; Deacon H.J. 1976; Parkington 1977a, 1991; Buchanan *et al* 1978; Parkington *et al* 1988).

Some of the more common plants recovered from archaeological sites in the southern Cape include *Freesia, Schotia afra sp., Tritonia* and a variety of grass species. *Cyperus textilis* was used for bedding and also to make rope, matting and nets (Grobbelaar & Goodwin 1952; van Wyk & Gericke 2000). *Helichrysum sp*. a soft, woolly-haired shrub is still used for bedding (Bohnen 1986; van Wyk & Gericke 2000) and in the western Cape seaweed was used for bedding at Hoffman's Cave and at Eland's Bay Cave (Deacon, H.J. 1972; Klein 1973, 1975).

A synthesis of the vegetation changes in the Cape ecozone can be constructed from pollen samples and archaeological floral data (Scott 2002). An increase in forest taxa is reflected in pollen profiles from Groenvlei and Norga during warmer and wetter conditions between 7000 B.P. and 3000 B.P. (Martin 1968; Scholtz 1986). Thereafter, grassland species increase and forest taxa decrease in the southern Cape. Prior to the present day renosterveld, grassland was the natural climax (Deacon & Lancaster 1988; Scott 2002). Cowling (1983) suggests that the most common vegetation in the southern Cape during the last 5,000 years was grassland rather than renosterveld as suggested by

Acocks (1953). An increase in forest cover is likely during the mid-Holocene high sea levels due to increased temperatures and precipitation. In the last 2000 years, conditions in the Cape were somewhat cooler and drier with a high grass component (Martin 1968; Scholtz 1986; Avery, D.M. 1982a, b, 1995; Scott 2000). Peat deposits from Cape Hangklip in the south-western Cape dated to between 6000 and 2000 B.P. show that fynbos vegetation is represented for the whole period and no significant changes are reflected (Gatehouse 1955; Deacon & Lancaster 1988; Cowling *et al* 1997).

Perhaps the most significant feature of the last 4000 - 5000 years is that, based on the available biological evidence, it was only during this period that modern plant and animal community alliances in the southern Cape were formed (Deacon & Lancaster 1988; Cowling *et al* 1997).

Genus / Species	**Family**	**Collect Code**	**Comm 1**	**Comm 2**	**Comm 3**
Agathosma apiculata	*Rutaceae*	A	C		
Azima tetracantha	*Salvadoraceae*	B	R	C	C
Canthium cf. mundianum	*Rubiaceae*	B			C
Carissa bispinosa	*Apocynaceae*	B	C	C	C
Cassine aethiopica	*Celastraceae*	A	C	D	D
Cassine maritima	*Celastraceae*	A	C	C	R
Cassine peragua	*Celastraceae*	B	R	C	C
Cassine tetragona	*Celastraceae*	A	R	R	R
Chrysanthemoides monolifera	*Asteraceae*	A	C	C	R
Clutia daphnoides	*Euphorbiaceae*	B	C	C	R
Colpoon compressum	*Santalaceae*	A	R	R	
Diospyros dicrophylla	*Ebenaceae*	B	R	C	D
Euclea racemosa	*Ebenaceae*	A	D	C	C
Leucadendron salignum	*Proteaceae*	B		R	
Lycium cinereum	*Solanaceae*	A	C	C	C
Maytenus procumbens	*Celastraceae*	A	C	C	R
Maytenus heterophylla	*Celastraceae*	B		C	C
Metalasia muricata	*Asteraceae*		C		
Myrica cordifolia	*Myricaceae*	A	C		
Myrsine africana	*Myrsinaceae*	A	R	R	R
Olea europeae subsp. africana	*Oleaceae*	B		R	C
Olea exasperata	*Oleaceae*	A	D	C	R
Olinia cymosa	*Oliniceae*	B			C
Passerina rigida	*Thymeleaceae*	C	C		
Polygala myrtifolia	*Polygalaceae*	A	R	R	R

Pterocelastrus tricuspidatus	*Celastraceae*	A	C	C	C
Putterlickia pyracantha	*Vitaceae*	A	R	C	R
Rhoicissus digitata	*Anacardiceae*	A	R	R	R
Rhus crenata	*Anacardiceae*	C	D	R	
Rhus glauca	*Anacardiceae*		D	D	C
Rhus laevigata	*Anacardiceae*	A	R	R	R
Rhus longispina	*Anacardiceae*	A	R	C	C
Rhus lucida	*Anacardiceae*	B			R
Salvia africana-lutea	*Lamiaceae*	A	R	R	
Syderoxylon inerme	*Sapotaceae*	A	D	D	D
Zanthoxylum capense	*Rutaceae*	B			C
Zygophyllum morgsana	*Zygophyllaceae*	A	C	C	

R = Rare C = Common D = Dominant

Collect Codes	Comm Data
A: Collected on red sands, Jongensfontein	Comm A: Thicket on white dune sand
B: Collected in forest, Heuningbos	Comm B: Thicket on older reddish sand
C: Collected on white sands, Jongensfontein	Comm C: Forest

Table 2.2: Woody plants collected in the Jongensfontein/ Blombosfontein area, southern Cape, South Africa.

Notes to Table 2.2.

1. Collection date: June, 1993.

2. Collection and Identification: Prof. Richard Cowling, (then: Botany Department, University of Cape Town now Nelson Mandela Metropolitan University, Port Elizabeth, South Africa).

3. The predominant vegetation in the Blombosfontein Nature Reserve area at present is dune thicket on white, calcareous sand.

4. *Myrica cordifolia, Passorina rigida, Rhus crenata* and *Metalasia muricata* currently are the dominant species in the mobile dune area of Blombosfontein Nature Reserve (possibly as a result of stabilisation / restoration attempts by Forestry Dept.).

2.8: Fauna

Mammals

The Cape Ecozone forms one of six ecozones defined within the southern African sub-continent. Major variables such as climate, topography, phytogeography and zoogeography characterise each ecozone but an overlapping of features prevents each region from being sharply divided. Due largely to the lack of vegetation suitable as animal food, the Cape Ecozone has the lowest diversity of large mammal species found in southern Africa (Klein 1984; Skinner & Smithers 1990; Stuart & Stuart 1988, 2001). Fifty species of large mammals are recorded historically in the Cape (Skead 1980) although even within this ecozone some of these animals were restricted by their habitat and dietary preferences and not all were endemic to the coastal areas of the southern Cape.

Elephant, Cape buffalo, hippopotamus and eland were present in the Riversdale District in the 17th- and 18th C. (Le Vaillant 1790; Raven-Hart 1967:21: Skead 1980). In 1777, William Patterson reported seeing lion spoor at Riviersonderend and both Anders Sparrman in 1775 (Forbes 1977a,b) and J.W. Moodie in 1820 recorded leopards near Swellendam. La Trobe saw wild dogs (*Lycaon pictus*), and hyenas (*H.crocuta & H.vilosa*) near Mossel Bay in 1816, and the latter were again reported in the Swellendam area in 1838 by James Backhouse (Skead 1980). By the latter part of the 19th C. most of the larger mammals, in particular predators, had been eradicated and most of the land on the Riversdale Plain had been granted for settlement by farmers.

The largest samples of well excavated faunal assemblages in southern Africa are derived from Holocene sites excavated in the Cape ecozone. After the Last Glacial Maximum warmer conditions and generally higher precipitation led to a gradual change from open grasslands to increasing forest or scrub cover in the southern Cape. Relatively higher numbers of vaalribbok, mountain reedbuck and roan antelope occur in early Holocene assemblages but are rare after 5000 B.P. (Klein 1980). At Nelson Bay Cave prominent grazers are replaced by small browsers by around 8000 B.P., although at Melkhoutboom and Elands Bay Cave the presence of hartebeest, buffalo, wildebeest and zebra in the Early Holocene implies an environment with more grass and less fynbos than at present (Klein 1973, 1975, 1980; Deacon, J. 1984a, b; Deacon & Lancaster 1988). Based on measurements of jackal, dune mole rats, hyraxes and grysbok recovered from Cape sites, Klein (1984) has demonstrated a correlation between past temperature and rainfall, and body size (Henshilwood *et al* 2001). Similarly, modern dune mole rats in low rainfall areas are smaller than those found in the high rainfall areas of the southern Cape (Klein 1984). At all Holocene sites in the southern Cape the micromammalian community structure was distinctly different to that observed during the Late Pleistocene (Avery, D.M. 1982a, b, 1995).

The effects of human predation, the introduction of herding, and accidental or deliberate and repeated burning of veld have also been cited as attributable factors in changes in faunal distributions during the Later Holocene (*cf*. Marais 1937; Deacon, H.J. 1972; Klein 1973, 1975; Avery, G. 1974; Deacon, H.J. 1976; Smith 1986; Parkington 1991; Deacon & Deacon 1999; Mitchell 2002).

The overall picture in the Cape Ecozone is one of a gradual change from grazers to browsers during the early Holocene and, by 5000 B.P., the large mammal communities were essentially similar to those of historical times (Klein 1973, 1980, 1984; Deacon, J. 1984b; Deacon & Lancaster 1988).

A recent survey indicates at least 26 species of mammals now occur in the area between the Goukou and Duiwenhoks Rivers (Stuart & Stuart 1988, 2001; Carter & Brownlie 1990; also *cf*. Inskeep 1987 for a list of southern Cape mammals). These include 12 species of rodents; the

African wild cat (*Felis lybica*), African lynx (*Felis caracal*); steenbok (*Raphicerus campestris*), grey rhebuck (*Pelea capreolus*); black backed jackal (*Canis mesomelas*); Cape porcupine (*Hystrix africaeaustralis*); Cape clawless otter (*Aonyx capensis)*, water mongoose (*Atilax paludinosus*), 2 species of genet (*Genetta sp*.); 2 species of hare (*Lepus sp*.); Smiths red rock rabbit (*Pronolagus rupestris*); the common mole rat (*Cryptomys hottentotus*). Sea mammals found in the southern Cape waters include the Cape fur seal (*Arctocephalus pusillus*) and a number of species of dolphins and whales (*cf.* Stuart & Stuart 1988, 2001; Skinner & Smithers 1990).

Fish

Ocean temperature is a critical factor in determining the abundance, distribution and presence of marine animals and plants. The generally warm waters found on the southern Cape coast are a combination of solar insolation and the effect of the Agulhas current originating in the tropical regions of the Indian Ocean. Periodic low water temperatures at the coast are the result of upwellings of cold water situated off the Agulhas Bank being driven onshore (Cohen 1993; Cohen & Tyson 1995). The resultant disparate conditions provide for enormous biodiversity, allowing both cold and warm water faunal communities to co-exist (Smith 1952; Tietz & Robinson 1974; Branch & Branch 1981; van der Elst 1988; Branch *et al* 1999; Heemstra & Heemstra 2004).

Rocky shores, sandy beaches and offshore reefs occur in the immediate vicinity of BBF providing conditions suited to a wide range of sea fishes. Additionally, to the east and west of BBF, estuaries are found at the mouths of the Duivenhoks and Goukou Rivers. Angling on this section of the coast is generally excellent although in recent years the number of fish landed has diminished due to excessive fishing. At least 25 species of edible fish are found in these waters, some of the more common species landed included galjoen (*Dichistius capensis*), elf (*Pomotamus saltatrix*), kob (*Argyrosomus inodorus/japonicus*) and white musselcracker (*Cymatoceps nasutus*) (Smith 1953; van der Elst 1988). During the Holocene fish were probably abundant in this area and the bones of both small and large species were recovered from a number of sites at BBF, and elsewhere along the southern Cape coast (*cf.* Goodwin 1946; Inskeep 1965, 1972, 1987; Klein 1973; Avery, G. 1975, 1976; Henshilwood *et al* 2001).

Shellfish

Five distinct inter-tidal zones are recognised on the rocky shores of the southern Cape coast. Highest on the shore is the Littorina zone, followed by the Upper Balanoid, the Lower Balanoid, the Cochlear and the Infratidal zone. Particular species of shellfish are adapted to specific conditions leading to regular zoning in each of the inter-tidal bands. Factors affecting the density and size of marine shellfish colonies are a combination of water temperature, light, salinity, wave action, available food and competition, both intra- and inter-specific. (Tietz & Robinson 1974; Branch & Branch 1981; Branch *et al* 1999).

During low neap tides a variety of edible shellfish species can be gathered from the upper shore. Greater exposure during low spring tides increases the number and size of species available for collection. The larger species of gastropods found in the lower intertidal zone include alikreukel (*Turbo sarmaticus*) and occasionally perlemoen (*Haliotis midae*). *Turbo* can be collected during neap tides as they also occur in the mid-tidal zone; their shells are ubiquitous in many middens along the southern Cape coast. A variety of limpets (*Patella sp*.) are easily gathered; periwinkles (*Diloma sp*.), whelks (*Burnupena sp.*), Venus ear (*Haliotis spadicea*.) and chitons (e.g. *Dinoplax gigas)* are common. Brown mussels (*Perna perna*) are found in large colonies attached to rocks in the upper- and mid-tidal zones and are easily collected. Other marine organisms, for instance crabs (e.g. *Cyclograpsus sp*. and *Plagusia sp.*) and octopus (*Octopus granulatus*), may be opportunistically gathered.

Shellfish offer a sessile, dependable source of protein and the large numbers of shell middens situated along much of the southern Cape coastline attests to the importance of this resource to prehistoric people.

Other Fauna

Additional fauna which may been utilised for food by prehistoric people in the vicinity of BBF includes a wide range of land and marine birds (*cf.* Sinclair 1987), amphibians and reptiles, including 4 species of tortoise, 22 of snake and 15 types of lizard (*cf.* Branch 1990). The recovery and identification of faunal remains from sites at BBF is discussed in Chapters 6 & 7.

2.9: Summary

Blombosfontein Nature Reserve is situated in a once active dunefield on the southern edge of a coastal foreland. It is bound to the east and west by the Goukou and Duivenhoks Rivers respectively; to the north of the coastal foreland are the Langeberg Mountains which form a part of the Cape Folded Mountain range.

Underlain by bedrock Palaeozoic deposits, the overlying Cenozoic sediments are known as the Bredasdorp Group and consist of five sedimentary groups. From oldest to youngest these are: De Hoopvlei and Wankoe of Mio/Pliocene age; Rooikrans and Waenhuiskrans of Pleistocene age; Witzand dunes deposited during the Holocene.

Calcretes and calcarenites of the Bredasdorp formation underlie most of the Holocene Witzand Formations at BBF and were formed during alternating wet-dry-wet conditions. Calcrete formation is an ongoing process at BBF and a heavily brecciated matrix surrounds the deposit at two of the sites.

Episodes of dune stabilisation alternating with periods of renewed aeolian activity are recorded during the aeolianite facies of the Holocene Witzand Formation at BBF. During the Late Pleistocene and Early Holocene a re-accumulation of dune ridges occurred as a response to a massive input of fluvial and aeolian deposits exposed during the Last Glacial transgression. High sea levels during the Mid-Holocene may have resulted in periods of dune stabilisation and increased vegetation cover at BBF. Renewed activation of the BBF dunefields is recorded during this century although this process may have started at an earlier date.

Eastwards facing sigmoidal bays, for example St. Sebastian Bay, are formed by the resistance of outcrops of the Cape Supergroup. A continental shelf, the Agulhas Bank, extends for more than 100 km to the south at Cape Barracouta. Table Mountain Group outcrops form an inner narrow shelf 4 - 15 km wide.

Sea levels on the southern Cape coast were between -100 m and -165 m during the Last Glacial Maximum. A steady rise in sea levels occurs during the Early Holocene and by the Mid-Holocene a + 2 m sea level is likely. During the Later Holocene a series of regressions are possible but after about 3500 B.P. modern sea levels were maintained. During the Early Holocene the sea was about 1 km from the present coastline at BBF. The impact of a predicted + 2 m sea level on the coastal cliffs to the south of BBF may have been minimal, although Blombos Beach to the west is likely to have been inundated, causing erosion of the coastal dunes. Shallow marine resources are unlikely to have been severely affected by a + 2 m transgression in the area below BBF as the irregular TMS outcrops are sufficiently elevated to allow marine organisms to move to a higher plateau.

Surface winds are strongly influenced by the general anti-cyclonic nature of circulation patterns in southern Africa and coastal winds are stronger along the coast than in inland areas. Predominant winds during winter and spring are from the west and south-west and in summer easterly and south-easterly winds predominate. Atmospheric moisture content is highest in the east as the Indian Ocean is the major moisture source for southern Africa. Mean annual rainfall for Still Bay is around 450 mm but higher precipitation is recorded in the catchment areas of the Duivenhoks and Goukou Rivers. The Riversdale Plain receives rain in all seasons with peaks in spring and autumn.

Coastal weather is also influenced by the Agulhas Current which is causative in establishing an extensive thermocline over the area during the summer months. Intra-annual variability in sea surface temperatures on the Agulhas Bank are determined mainly by solar insulation but strong south-westerly winds in winter may also force warm water plumes inshore. An average amplitude of 5 ^{o}C in sea surface temperatures recorded over a 20 year period at Still Bay provides evidence for strong seasonal signals with mid-summer highs and mid-winter lows.

Based on a range of evidence including pollen, micromammals, charcoal, botanical studies, terrestrial fauna and ocean based research a palaeoclimatic model for the southern Cape has been established. A synthesis of this data suggests that during the Early Holocene, land and sea temperatures increase but precipitation is relatively low. Summer rainfall on the southern Cape coast increases in the Mid-Holocene due to higher air temperatures. Sea surface temperatures are 2 ^{o} C. higher than at present. After 3300 B.P., sea surface temperatures show a slight decrease at Nelson Bay Cave and again at 650 B.P., possibly associated with the start of a Little Ice Age. A higher grass component and a lower incidence of forest taxa suggests cooler conditions in the Cape after 2000 B.P. Optimum forest conditions are likely to have prevailed in the Cape between 6000 - 2000 B.P.

The modern vegetation of the Riversdale Plain has, until recently, been poorly documented. Recent surveys show three major vegetation groups occur on the Riversdale Plain. A Dune Asteraceous Fynbos is supported in the BBF environment with a high cover of Rutaceae and Restionaceae. To the north and west of BBF, Dune Thicket replaces Dune Asteraceous communities and is characterised by a high cover of fleshy-leaved shrubs. Typical among Dune Thicket species are milkwood, *Syderoxylon inerme,* which has a spreading canopy and is well suited for use as a campsite. Dune Thicket species are likely to have occurred within BBF in the past when the dunefields were stable. Ground cover, on the other hand, would have been minimal or absent during periods when the aeolian dunes were active. Vegetation during the Late Holocene at BBF is likely to have alternated between a light Dune Asteraceous Fynbos cover and unvegetated shifting dunes. In the latter period possible burning of vegetation in the BBF area by herders, and later by Dutch farmers, may have impacted considerably on the stability of the Dune fynbos.

Seven of the excavated sites at BBF predate 3000 B.P. and all are located within the dunefield area. Sites postdating 2000 B.P. are located in shelters to the seaward side of the coastal cliffs. One of the reasons for the variation in the location of BBF campsites may be changes in vegetation cover in this area during the Late Holocene.

Based on available biological evidence it seems that modern plant and animal community alliances were only formed in the Cape during the last 4000 - 5000 years. The Cape Ecozone, one of six ecozones defined within the southern African subcontinent, has the lowest diversity of large mammal species. A number of well excavated faunal assemblages are derived from Holocene sites located in the Cape Ecozone. Prior to 8000 B.P. grazers are dominant but are gradually replaced by small browsers. Animals such as vaalribbok, mountain reedbuck and roan antelope are rare in assemblages which postdate 5000 B.P.

Small mammals, such as dune mole rats and hyraxes are more common in later assemblages in the southern Cape and indicates a greater use of small food parcels during the Mid- and Later Holocene. Faunal assemblages from BBF sites provide evidence that a diverse range of animals were collected, hunted or opportunistically scavenged. Various species of shellfish provided a dietary staple and may have been one of the principal reasons for coastal visits. Fish were also caught; sea birds trapped; and seals hunted or scavenged. There is evidence of a whale at BBF 9, probably scavenged after a wash-up. Bovids, ranging from eland to grysbok, were hunted or trapped. Evidence of a variety of smaller animals including tortoises, snakes, lizards, birds, dune mole rats, hares, and hyraxes illustrates the diverse tastes of the BBF inhabitants.

CHAPTER 3

ETHNOHISTORY OF THE SOUTHERN CAPE

3.1: Introduction

During the 15th C. Portuguese explorers sailed around the tip of Africa and landed on the southern Cape coast. Vasco da Gama and Bartholomew Diaz both stopped at Mossel Bay and reported contact with indigenous people (Axelson 1940, 1954, 1960, 1973a,b). In 1576, Manuel de Mesquita Perestrello arrived at the Breede River mouth and named the bay between Cape Infanta and Cape Barracouta after St. Sebastian. A party of seamen were landed at the Breede River mouth and walked overland to Cape St. Bras (Mossel Bay), presumably crossing close to the present BBF area (Fontoura da Costa 1939; Kruger & Beyers 1977).

Calibrated radiocarbon dates for some of the excavated sites at BBF overlap with those of the early explorers; BBC layer L1 dates to 1651 A.D. and BBF 9, Layer OH to 1493 A.D. One method of broadening our interpretation of the BBF archaeology for this period is to examine the ethnohistorical records for this region.

Warnings abound as to the uncritical use of ethnohistoric accounts in the interpretation of archaeological evidence (e.g. Avery 1976; Gordon 1984; Klein 1986; Henshilwood 1990; Solway & Lee 1992; Echo-Hawk 2000; Hodder 1986, 2003). The same criticisms often levelled at archaeologists in their imprudent use of ethnographic analogy can equally be applied in the field of ethnohistory. Rigorous standards of empirical observation, developed in the archaeological field, are frequently not applied to the evidence afforded by ethnography, leading to weak and ambiguous analogies (Gould 1977:362). Furthermore, the uncritical use of analogy may mask an understanding of past behaviour by imposing on it, and limiting it to the categories of the ethnographic or ethnohistoric present (Ascher 1961; Gould 1977; Yellen 1977; Gordon 1984; Wylie 1985; Solway & Lee 1992). Hodder (1985; 1986, 2003) has pointed to the inadequacies of examining the relationship between statics (the archaeological record) and dynamics (human behaviour) without understanding the generation of that relationship by individuals in an active social context.

Compilations of ethnohistoric accounts of indigenous people in the Cape (eg, Axelson 1954; Thom 1952; Raven-Hart 1967) clearly illustrate the problems of the relationship between archaeology and historic observation. Eurocentric viewpoints surface in the use of words such as 'savage' and 'barbaric' to describe the local inhabitants, implying the use of a value system heavily loaded in favour of European cultural norms and which frequently fails to grasp the complexity of interaction amongst indigenes (*cf*. Raven-Hart 1967). Observations frequently lack ethnographic objectivity and thoroughness and as such are not directed at the questions which concern archaeologists (Klein 1986).

The instigation of a trade in livestock with local herders by the Europeans, the formation of alliances, and the later establishment of a permanent Dutch presence at the Cape in 1652, led to gradual changes in local economic and subsistence strategies, demographics and intergroup dynamics. In addition, a large body of ethnohistoric data postdates the mid-17th C., and may not therefore reflect conditions during the prehistoric period.

Early misconceptions arising from attempts to group indigenous people illustrate the points above. Mendelslo, who visited the Cape in 1639, describes two distinct groups, *Watermen* and *Solthanimen.* The former, he says, live by the shore eating herbs, roots, fishes and dead whales, the latter own cattle and sheep and being dependent on adequate grazing for their stock move between the coast and inland pastures. In later accounts the *Watermen* are also described as *Strandloopers (litt.* beach walkers) (Raven-Hart 1967). In a report to van Riebeeck in the 1650s, Herry, initially himself described as a *Waterman*, added a third group called *Fishermen* who subsist on fishing, own cattle and are continuously at war with the *Saldanhamen (Solthanimen*). Herry's group, who through past misfortunes had been forced to rely on coastal resources, later acquire cattle from the Dutch and revert to a herding way of life (Thom 1952). A further cultural group, the *Soaqua* or *Sonqua*, who live a 'meagre existence' and own no stock, are met with by Jan Wintervogel on an expedition inland. He also notes that the so-called *Fishermen* do not always possess cattle and equates the *Sonqua* with the *Fishermen*. This is later confirmed by Herry who also states that cattle are only acquired by the *Fishermen* when stolen from the Sal*danhamen (Solthanimen),* hence the constant state of war between the two groups (Thom 1952).

Confusion in the grouping and naming of the two economic groups persists throughout the ethnohistoric literature and misnomers, such as *Strandlooper (alt. Strandloper)*, persist to the present day (*cf.* Raven-Hart 1967; Avery 1976; Jerardino 2003; Sealy *et al* 2004). The clearest distinction which characterises indigenous groupings at the Cape can be made on economic grounds. San hunter gatherers (Bushmen, Soaqua, Sonqua, Watermen, Fishermen) subsisted by utilising a wide range of resources inland and on the coast, possibly on a seasonal basis, and did not manage stock although sheep and cattle may have been opportunistically stolen (e.g. Schapera 1926, 1930; Raven-Hart 1967; Deacon, H.J. 1976; Buchanan *et al* 1978; Parkington *et al* 1988; Parkington 1991). Khoe groups (Khoekhoe, Hottentots, Saldanhamen) on the other hand were pastoralists who managed domestic stock, but also hunted and gathered and were seasonally transhumant (e.g. Kolben 1738; Schapera 1930; Epstien 1937; Goodwin 1952; Raven-Hart 1967; Robertshaw 1978; Smith 1986, 1987; Klein 1986). Transitional categories for people falling in the grey area between the two may include hunters acquiring stock and becoming herders, herders losing stock and reverting to hunting and gathering and various forms of clientship. Social and economic differences between these two groups, and recognising these differences in the archaeological record, is the subject of an ongoing and lively archaeological debate (*cf.* Denbow 1984; Schrire 1984, 1992; Parkington 1984, 2001; Smith 1986, 1990a,b; Hall 1986; Klein 1986; Parkington & Mills 1990; Smith *et al* 1991; Sadr *et al* 2003). These issues are discussed more fully later in this chapter and in Chapter 7.

Despite the limitations imposed by ethnohistorical analogy there is merit in the judicious application of some of this data in expanding our understanding of the later archaeological record at BBF. For instance, the recorded presence of Khoe huts, cattle and sheep on the Riversdale Plain coincides roughly with the occupation of Layer 1 at BBC and this information may be useful in understanding the identity and purpose of these coastal visitors. For obvious reasons attempts at using ethnohistoric data to interpret earlier BBF sites must be less secure.

3.2: Ethnohistory of the Riversdale Plain

Although Perestrello was possibly the earliest European explorer to make contact with indigenous people on the Riversdale Plain in 1576 there is scant record of this meeting (e.g. Axelson 1960; 1988; Kruger & Beyers 1977), presumably he was more intent on finding a suitable port for future Portuguese ships. The Breede River mouth was described by Perestrello as adequate to 'shelter a great fleet' (Kruger & Beyers 1977:681) but later explorers preferred the shelter of Mossel Bay situated 100 km to the north-east. Both da Gama and Diaz had sought refreshment in Mossel Bay in the late 15th C., as the Dutch seafarers did a century later. Although not on the Riversdale Plain, Mossel Bay ethnohistory contains some interesting early accounts of the regions indigenous people on the coast. Cornelis de Houtman, arrived at Mossel Bay on the 2nd August, 1595 aboard the 'Mauritius' and his journal records the crews contact with locals and their efforts to obtain fresh meat. The extract below is translated from the Dutch account (Rouffaer & Ijzerman 1915; Cape Archives VC94 No.1).

> The locals were very afraid but after a while they came up to our two people .... We asked them to bring sheep and cattle in exchange for money but they did not know of any money but only wanted iron, copper and bracelets. They spoke in their own way and indicated that they would bring cattle but when we heard them talk we wondered about their speech as they spoke like turkeys gobbling through their throat, they had ugly, flat noses and teeth like dogs and had an animal hide around their waist and in front of their manliness the tail of an ox and wide pieces of leather tied around their feet. They smelt so much that we could not stand their company. They were very glad when we gave them a small knife and within one hour they went and fetched four sheep.

On the fifth instant we went ashore again and bartered with the 'wild ones' exchanging iron for animals and we shot the best of the animals with our muskets ... they saw us throw away the stomach and intestines and they grabbed these. .... soon after they made a knife from a stone and cut the stomach open with it. They shook the dirt from the stomach and ate the stomach as if they were dogs.

On the 9th August about forty men armed with muskets went inland to find the Bushmen's living places. When our people had travelled some distance towards the mountains, the wild ones ran away and started to make fires everywhere. Some of our people returned as they could not walk due to scurvy.

This account, and others like it (*cf.* Thom 1952; Raven-Hart 1967) provide some clues as to the local economy. Sheep and cattle were in the vicinity of Mossel Bay, presumably indicating the presence of Khoe herders. A local knowledge of iron and copper suggests that bartering had taken place previously, possibly with earlier seafarers, but the expedient manufacture of a stone knife may indicate that iron was not in common use, or at least not by the people they met. In other respects the account is ambiguous; what was the identity of the 'Bushmen' people they met, were they coastal hunter gatherers acting as go-betweens for the Khoe, or were they itinerant stock owners trading opportunistically?

In July, 1601, Paulus van Caerden aboard the *'Hof van Holland'* records they were unable to obtain fresh meat at Mossel Bay as the eight 'natives' they met did not possess stock. However, a week later the ship is driven close inshore at Vleesch Baai, 50 km to the north-east of Still Bay where they are able to trade with the locals 'as many oxen, calves and sheep as they wanted until the salt for drying ran out'. On the 23rd July they are forced to anchor in Visch Baai, slightly to the east of their last location, but are only able to obtain five sheep (Cape Archives VC94 No.1).

The above accounts suggest that in the late 16th C. Khoe people with sheep and cattle could be found along the coast in the vicinity of the Riversdale Plain during the winter months, but that their location was not fixed, possibly due to a need for fresh pasture. Other coastal dwellers, without stock, were also encountered who presumably hunted and gathered opportunistically. Whether they occasionally acted as agents for the pastoralists is not clear.

In the latter half of the 17th C. relations between the Dutch and western Cape Khoe deteriorated and the large amounts of fresh meat required to provision passing ships became increasingly difficult to obtain. As a result the Dutch looked to setting up trade relations with the Khoe in the southern and south-western Cape. By 1660 the pastoralists occupying the area between the Breede and Gouritz Rivers, known as Hessequas, had been contacted and were reputed to be 'rich in cattle' (Mossop 1931). The Houtniquas occupied the area to the east of the Gouritz River up to Algoa Bay, and to the west the Chainoqua were situated between Swellendam and the Hottentots Holland Mountains (Kruger & Beyers 1977). In 1667, Sergeant Cruijthoff met with Hessequas at the Breede River and his party returned with 170 cattle and 300 sheep. The following year Hieronymous Cruse sailed to

Mossel Bay on the 'Voerman' to set up trading relations with the Khoe (van Wyk 1988). Further expeditions to obtain sheep and cattle from the Hessequas are recorded in 1685 and 1686 (Resolution of Council, DEIC). In 1687, Gammou Kouchama, described as a Hessequa 'captain', visited the Castle in Cape Town to invite further trade with his 'country' described as 'populous and overflowing with oxen, sheep and goats' (Moodie 1838, 1841). There is no evidence that the Khoe kept goats, historically or archaeologically, and this reference to goats may be an error in translation.

Ensign Isak Schrijver, sent to trade with the Hessequas in January 1689, recorded his journey across the Riversdale Plain in considerable detail. At the Duivenhoks River his party meet thirteen Hessequas who were sent to direct them to 'the Swart Captains kraal'. The following day they pass 'many kraals of Hessequas' and outspan at the kraal of the 'Captain', also known as the 'Oude Heer'. In the vicinity of modern-day Riversdale, Schrijver reports 'we saw on all sides Hessequa kraals' and the following day more kraals are noted near the Gouritz River. At this point the Hessequas who accompanied Schrijver are sent away and 'out of mischief' set fire to the veld. Schrijver returned to the Castle two months later with over 1000 cattle (Mossop 1931). In 1690 Schrijver returns to the Riversdale area to barter for livestock, and again in 1692 and 1693. During the last two expeditions he records that the Hessequa are increasingly hostile and it is becoming difficult to obtain stock (Beyers 1981).

However, Jan Hartogh meets with a party of Hessequa 'Captains' at the Breede River in 1707 who indicate they are most willing to trade their sheep and cattle. One reason for this change in attitude may relate to the deaths of large numbers of Khoe from war and sickness in 1665, 1672 and 1673. A major outbreak of smallpox in 1713 is estimated to have killed ninety percent of the Khoe population. An entry in the Company diary dated 6th May, 1713 notes that the 'Hottentots' are almost extinct (Godee-Molsbergen 1916b). After the smallpox epidemic many new 'Captains' are appointed and new 'tribe' names are also recognised, for example the 'Gouritz Hottentots' (Godee-Molsbergen 1916b; Goodwin 1952; Elphick 1977, 1985). Despite these setbacks the trade in livestock with the Hessequas continues; for example, Lichtenstein visits the Zoetemelks Valley in 1803 and notes that the Cape government use this area to rest cattle bought from the Hessequas and Outeniquas (Plumptre 1928, 1930).

The presence of Khoe kraals on the Riversdale Plain is recorded intermittently by travellers to the area during the 18th C. A number of Hessequa kraals are reported near the Gouritz River by Carel Haupt in 1752 (Godee-Molsbergen 1922) and in 1776 Hendrik Swellengrebel records seeing a number of kraals, most consisting of six to seven huts (Godee-Molsbergen 1932). It seems likely, though, that the power and population of Khoe people on the Riversdale Plain had been considerably diminished by the mid 18th C., effectively opening the land for settlement by Dutch colonists.

During the late 18th C. and early 19th C. most of the land on the Riversdale Plain was subdivided by the Cape Government and allocated to settlers of European origin, although scattered groups of Khoe herders were still in evidence. On a visit to Commandant Lombard's farm in 1803, J.W. Janssens reports that Khoe kraals can still be seen on the Slang River, one hour away from his hosts farm situated on the Duiwenhoks River (Godee-Molsbergen 1932). The application by H. van de Graaff to the Earl of Caledon for the granting of the land rights to the farm Blomboschfontein, on which Blombosfontein Nature Reserve is situated, is dated 1808.

By the mid-19th C. most of the Khoe were no longer stock owners and had been recruited by the Dutch as servants. The demise of the Khoe is best summed up by Lt. Henry Pemberton who records visiting a local farmer near the Gouritz River mouth in the mid-1800s (Kruger & Beyers 1977).

> The Dutch farmer at whose house we lodged, Frederic Potskeeter, a native of the country, informed us he had lived at Croutz Riviere 17 years ... he has a few slaves, mostly Malays with Hottentot servants ... The original inhabitants, the Hottentots, are of peacable, mild and laborious dispositions making most excellent household and farm servants, and free from slavery. The country is at present but thinly inhabited by Dutch.

There are few historical references to San hunter gatherers in the vicinity of the Riversdale Plain. O.F. Mentzel refers to 'Bushmen' living in the Swellendam and Riversdale mountains who rob the other 'tribes' when they have the opportunity. He also records the presence of San 'Bushmen' in the Mossel Bay area (Mandelbrote 1921;1944:330)

> From Mossel Bay to the Gamtoos River only Bushmen are found who manage to exist in small numbers, either in the crevices of rocks or in miserable hovels. They live on game, roots and herbs but occasionally also help themselves to an animal belonging to one of the colonists who are very scattered and isolated in these regions. They seldom take more than one at a time, for they never keep a live animal with them overnight.

In a letter written by C.H. Heese in 1929, he comments on the age of the fish traps at Still Bay by referring to stories told by the first 'Voortrekkers' who settled in the area during 1810 - 1820. At the time the 'Voortrekkers' arrived, there were still 'wild Bushmen' living on the coast and operating fish traps between the mouths of the Goukou and Duiwenhoks Rivers. Parts of Heese's letter are translated below (own translation).

> Whether they belonged to the Hessequa or the Attaqua tribe will only be determined by academics when they consider the names of the old farms in the area such as Wankou, Kragga etc. The kitchen middens on the sand dunes along the coast, also at Platbosch, provide overwhelming evidence that the Khoisan who lived near Still Bay were very fond of fish; fish, both great and small and shellfish of all types. Undoubtedly they also gathered fish that washed up on the coast.

Heese's letter effectively sums up the problems inherent in determining the origins of these coastal hunter gatherers. It is quite possible they were Hessequas, dispossessed of their stock and pasture, who chose to hunt and gather along the coast rather than be taken into service by the Dutch. On the other hand they may have been the remnants of San hunter gatherer bands whose territory had been gradually diminishing, both due to the expansion of the Khoe in the area during the previous 2000 years, and now due to Dutch land claims. No evidence of such late occupation was found at BBF and at present the identity of these last coastal hunter gatherers remains enigmatic.

3.3: Observations at Garcia State Forest: 1928-9.

Although not strictly ethnohistoric, this section deals with observations made by C.H.Heese in the BBF area in the late 1920s. Heese named the BBF area 'Blombosch Sands' after the shifting dunesands which then characterised this area. The information Heese provides is useful as some of the sites he describes are covered by sand and no longer visible, suggesting the BBF area may have been occupied more regularly than is currently apparent. Surface collections of selected lithics, although not specifically documented, may have been made from some of the sites currently excavated at BBF.

Numerous bones of elephant, rhino, buffalo and other animals were observed protruding from the sand along a western route through the dunes and Heese claims this may have been an ancient game trail. The same route had been followed for decades by local farmers who regularly brought their cattle from inland pastures for watering at the numerous 'bakke' or springs located on Blombos Beach and at the base of the cliffs. One reason for this seasonal movement may be related to copper deficiencies – inland grazing provided the required copper but this was not the case at the coast (Schulz *et al* 1951). However the coastal grazing did provide vital calcium necessary for bone growth (van der Merwe & Perold 1967).

Alongside the protruding animal bones he noted at least a dozen small 'Wilton' middens containing variously bone, shell, stone pestles, bored stones, a bone amulet, some sites with pottery and also two skeletons protruding from the sand. Walking eastwards along the clifftops he came across further 'Wilton' middens composed of shell, bone, stone chips and tools in quartzite, quartz and silcrete. In some cases the action of percolating calcium carbonates had cemented the assemblages into a solid breccia, the effect of which was to protect the stone artefacts from the erosive actions of the wind and sand.

Implements from the MSA 'Still Bay Culture' were also noted, as were some ESA or 'Stellenbosch' handaxes. Below the cliff face, and at the eastern edge of BBF 1, a number of rock shelters were reported, one of which contained a deep layer of shells and which Heese (n.d.) describes as a 'Wilton station'. From a nearby shelter a skeleton was recovered by the local schoolmaster.

3.4: Summary

At about the same time that early European explorers were recording their observations at the Cape, BBC and BBF 9 were occupied by indigenous people. Ethnohistoric documents, if used judiciously, can be a useful adjunct in the interpretation of the later occupations at BBF.

In the historic period two distinct economic groups can be recognised at the Cape, namely hunter gatherer egalitarian San who did not possess livestock and pastoralist Khoe groups, hierarchically structured, who accumulated wealth by managing sheep and cattle but also hunted and gathered.

Representatives of both groups are recorded historically within the Riversdale Plain region. Reports of the Hessequa Khoe are more numerous than that of San, presumably because of greater Khoe/ colonist contact due to an active trade in livestock in the 17th- and 18th C. Contact was made with Khoe pastoralists both at the coast and inland suggesting that the Khoe made use of grazing opportunities in a range of environments, possibly, in part, to obtain the necessary trace elements required by their cattle (Schulz *et al* 1951). Although the hierarchical structures existing within the Khoe groups on the Riversdale Plain are only hinted at, the Dutch recognised that a distinct group, known as the Hessequa, occupied the coastal foreland between the Breede and Gouritz Rivers. During a visit by a Hessequa 'Captain', Gammou Kouchama, to the Castle at Cape Town in 1687, reference is made to the 'king' of the Hessequas, suggesting that some unity existed at that stage among the Riversdale Plain pastoralists. War and disease, particularly smallpox in the early 18th C., decimated a large section of the Khoe population in most areas of the Cape leading to demographic changes and the emergence of new 'tribal' groupings. At about the same time Dutch farmers were expanding into the southern and south-western Cape, filling the land vacuum left by the diminished and fragmented Khoe survivors. By the early 19th C. only small surviving groups of Khoe pastoralists were scattered in the southern Cape and many had been taken into service by the Dutch settlers.

Few historic records relate the presence of San in the southern Cape, although accounts from elsewhere in the Cape are more numerous. It seems likely that parts of the Riversdale Plain area were inhabited by San but due to the remoteness of the regions they occupied, contact between San and travellers or colonists was an infrequent occurrence. However, there are a few incidents where Dutch and Portuguese explorers, in the 16th and 17th C., report the presence of indigenous folk at the coast who do not possess stock and live on shellfish and fish. In the Riversdale and Mossel Bay areas, O.F Mentzel, indicates that there were still San people living on the fringe of Khoe society in the late 18th C (Mandelbrote 1921, 1925). In the region of BBF, Heese (n.d.) relates the presence of coastal hunter gatherers in the early 1800s. The origins of these later 'Bushmen' are not clear; they may have been dispossessed stock owners or surviving San.

The fate of the hunter gatherer San in the southern Cape is mostly unrecorded. This is not surprising as San survival depended on escaping detection by Khoe and colonist, by whom they were frequently hunted. In the Eastern Cape Mentzel records that on two separate occasions traps were set by Dutch farmers to trap 'Bushmen'. In one instance in 1775, 122 'Bushmen robbers' were reported shot. (Mandelbrote 1921, 1944).

Based on ethnohistoric accounts of the Riversdale Plain it is clear that the Khoe were well established in the region by the 17th C. and probably had been for a considerable time prior to this date. The presence of sheep bone at BBC, radiocarbon dated at 1960 ± 50 B.P, indicates a long history of pastoralism in this region (Henshilwood 1996). BBC was repeatedly occupied during the last two millennia and it seems certain that the occupants of this site witnessed some of the major changes which occurred in the Riversdale Plain region at this time, firstly the advent of livestock at around 2000 B.P., and secondly, the arrival of the first Europeans.

CHAPTER 4

HOLOCENE ARCHAEOLOGY OF THE SOUTHERN CAPE

4.1: Introduction

This chapter provides a synopsis of the archaeology of the southern Cape primarily, and sets the background for the chapters that follow. As the oldest Later Stone Age excavated site at BBF is radiocarbon dated at 6960 ± 70 B.P. and the youngest at 290 ± 20 B.P. the discussion in this chapter centres around the archaeology of the Early Middle- to Late Holocene period.

Assemblages containing ethnographically known items of material culture appear during the last 40,000 years in southern Africa (Deacon & Deacon 1999; Mitchell 2002), although it is only during the Holocene that characteristic Later Stone Age (LSA) elements commonly occur at most sites. The similarity between articles typically occurring in LSA sites (see below and *cf.* Deacon, J. 1984b:221-222; 1990) and the material culture of the historically known San and Khoe suggests that LSA sites represent the prehistory of these indigenous people.(*cf.* Goodwin & van Riet Lowe 1929; Goodwin 1935; Clark 1959; Inskeep 1967; Deacon H.J. 1972, 1976; Parkington 1972, 1977; Phillipson 1977; Deacon, J. 1984b, 1990; Rightmire 1984; Deacon & Deacon 1999; Mitchell 2002). However, the material culture of the LSA should not be viewed as an unchanging static entity but rather as a continuing tradition, subject to gradual modification and adaptation through the effects of diffusion and migration (Deacon, J. 1984b, 1990).

For most of the Holocene, San hunter gatherers had exclusive use of the coastal and interior regions of the Cape. Pastoralism was introduced to the Cape at around 2000 B.P. (Henshilwood 1996), possibly by herder groups originally from northern Botswana. San social organisation and subsistence strategies at the Cape were disrupted by the economics of herding, possibly only marginally initially, but by historic times hunter gatherers had been forced into peripheral areas (Smith 1986; Parkington 1987; Parkington *et al* 1988; Hall 1986; Smith *et al* 1991; Jerardino 1998, 2003; Sadr *et al* 2003).

Iron Age, Bantu-speaking agropastoralists arrived in South Africa about 1600 years ago but were confined by the nature of their crops to the summer rainfall areas in the eastern and central regions (Mitchell 2002). In the Cape they only penetrated as far south as the Great Fish River, 800 km east of Cape Town (Maggs 1984). Although contact was made with local San groups the effects of this interaction are only archaeologically visible within the immediate area (Hall 1986). More extensive contact may have occurred between early Khoe pastoralists and Iron-age agropastoralists in the western part of the sub-continent - at about 1600 B.P. both groups had domesticated sheep and cattle and made pottery (Sealy & Yates 1994; Henshilwood 1996).

As a result of archaeological excavations at a number of sites in the Cape over almost a century a substantial base of information has been built up documenting the occupation of the region by indigenous people during the Holocene. The results of this research, particularly in the southern Cape, are discussed in this chapter. In later chapters the results of the excavations at BBF are interpreted with reference to our present understanding of the archaeology of the region.

4.2: History of LSA archaeology

Based largely on recovered lithic implements, the LSA tradition in South Africa was first defined in the 1920s by Goodwin (1926, 1935) and Goodwin & van Riet Lowe (1929). They saw the LSA as being essentially similar to the Mesolithic in Europe, divided it into two main industries, the Wilton and the Smithfield, placing the origins of the Wilton microlithic industry to the north, and proposed a 'successive wave' or invasion theory to account for its arrival in the south (Goodwin & van Riet Lowe 1929).

In the following decades an expanding data base allowed for more detailed inter-site comparisons. A number of LSA coastal and near-coastal cave sites in the Cape were excavated (e.g. Dreyer 1933; Goodwin 1935, 1938, 1946; Drennan 1937; Grobbelaar & Goodwin 1952; Fagan 1960; Louw 1960), as well as open station shell middens, or 'kitchen middens' (e.g. Colson 1905; Goodwin 1946; Rudner & Rudner 1954; Mabbutt *et al* 1955) (*cf.* Fig. 1.1). However, the orientation of most interpretations remained lithocentric (but *cf.* Deacon & Deacon 1963; Wells 1965) and the 'invasion' hypothesis was retained. Few attempts were made to test this 'invasion' model, most explanations resting on what J. Deacon (1984a) terms 'post-hoc' accomodative arguments (e.g. Clark 1959; Sampson 1967, 1972, 1974).

Re-excavation and subsequent interpretation of the Wilton rock shelter in the Eastern Cape demonstrated ongoing stone artefact changes through time and the Wilton tradition was likened to an ontogenetic model which stresses cultural change associated with continuity (Deacon J. 1972).

Ecological modelling formed a composite part of most research strategies in the 1970s and hypotheses were proposed which related climatic and environmental variables with perceived cultural, subsistence and demographic change. Early examples of this new approach in the southern Cape were at Nelson Bay Cave (Klein 1972a,b, 1974) and Melkhoutboom (Deacon, H.J. 1972, 1976), where changes in artefact manufacture were linked to a shift in hunting patterns, rising sea levels and environmental changes in the Late Pleistocene and Early Holocene. Although ecocentric 'cause and effect' modelling is now regarded by some as too simplistic, ignoring as it does the 'human' factor as a catalyst for change, it remains an essential determinant in defining the parameters within which 'human' choice could have been exercised (*cf.* Deacon, J 1984a,b, 1990; Bailey & Parkington 1988; Mazel 1989; Wadley 1989; Henshilwood in press).

The contributions of Klein (1972a, b, 1973) and H.J Deacon (1972, 1976) led to the naming of a three stage system in the Later Stone Age of the Southern Cape, namely Robberg, Albany and Wilton, with a further Pottery Wilton subdivision in the post 2000 B.P. period, the latter associated with the arrival of pastoralist people (*cf.* Deacon, J. 1984a). These culture-stratigraphic sequences can be broadly applied to all known LSA assemblages situated within, and to the seaward side, of the Cape Folded Belt Mountains in the Western Cape Province.

In a later study the correlation between environmental change and stone artefact manufacture was tested at three sites in the Southern Cape, namely Nelson Bay Cave, Kangkara and Boomplaas. Although the timing of the changes for the Robberg, Albany and Wilton Industries are similar at all sites, some assemblages reflected minor variations in toolkits which were site specific. On the other hand, macroevolutionary or significant changes in lithic tool traditions cut across environmental boundaries and subsistence strategies, and a direct relationship between environmental change and stone tool manufacture could not be demonstrated (Deacon J. 1984a).

Parkington's (1972, 1976, 1999) pioneering study on floral and faunal remains found at coastal and inland sites in the Western Cape is linked to ecological modelling. The results suggest that some LSA people followed seasonal subsistence rounds. Archaeological evidence from other sites in the southern and south-western Cape has been interpreted as support for a seasonal subsistence model (*cf.* Shackleton 1973; Deacon, H.J. 1969, 1976; Klein 1973; Avery, G. 1976; Buchanan *et al* 1978; Parkington1977a, 1991, 2001). This model has been challenged based on dietary evidence extracted from human bones buried at archaeological sites. (e.g. Sealy *et al* 1986, 2000; Sealy & van der Merwe 1985, 1992; Jerardino *et al* 2000) .

4.3: The Holocene Period (8,000 - 2,000 B.P.):

At around 8000 - 7000 B.P. the Albany Industry is broadly replaced by the microlithic Wilton Industry in the southern and eastern Cape and is accompanied by a florescence in the number of occupation sites (Deacon 1984b; Deacon & Deacon 1999; Mitchell 2002).

The type site of the Wilton culture, Wilton Large Rock Shelter, is situated near Alicedale in the eastern extension of the Cape Folded Belt Mountains (Deacon & Deacon 1999) and was first excavated by Hewitt (1921), and later by H.J. Deacon. The lithic assemblage from the Wilton site was described in terms of an ontogenetic model displaying typical formative/maturity/decline phases (Deacon, J. 1972). The formative range of the new Wilton is at around 8000 B.P. with little variety in tool types and a low artefact density. Scrapers are small and round, mainly in chalcedony.

The climax phase lies between 5000 - 2500 B.P., with a high density of artefacts and a wide variety of tools recorded. Formal tools are dominated by a selection of small scrapers less than 20 mm in length with a mean width/length ratio of 1:1. Backed microliths include blades and segments. The predominant raw material is silcrete, with some quartz and chalcedony. After around 2300 B.P. the scrapers are more similar to those in the early layers as is the tool inventory. The artefact density decreases and although silcrete remains dominant, there is increasing use of shales and quartzite. The Wilton system is in decline after 2000 B.P., scrapers become more variable , the number of tool types declines, there are no adzes and few backed tools, and a wide variety of raw materials is evident. These changes coincide with the arrival of pottery makers/ herders and it is possible that they replaced the existing population at the Wilton site. The changes in the faunal component at the Wilton site are broadly coincident with those of the lithics. In the formative phase, small game are mainly present and marine shells indicate coastal contact. This continues through the climax phase with evidence of some freshwater mussels. After 2300 B.P. there is a marked decline in marine shells and a pronounced shift to the freshwater mussel, *Unio caffer*.

The trajectory of lithic change at Wilton is broadly consistent with a number of southern Cape sites. Amongst others, these include Oakhurst (Goodwin 1933, 1938; Schofield 1938), Glentyre (Fagan 1960), Melkhoutboom (Deacon, H.J. 1976), Kangkara (Deacon, J. 1984a) and Boomplaas (Deacon, J. 1984a). Lithic assemblages from a number of coastal sites, however, reflect considerable variation from the Wilton pattern. The formal tool component at Nelson Bay Cave (Inskeep 1987) during the Holocene comprises scrapers, backed scrapers, segments, some doubtful backed bladelets, tanged points, drills, reamers, bored stones, two doubtful adzes, sinkers, grooved stones and ochre pencils, but all in relatively small numbers. This is despite the fact that the total number of stone artefacts at the site exceeds 47,000 units; 82% of these are of quartzite. During the period 6000 - 3300 B.P. the majority of scrapers are of chalcedony, followed by quartz with some of quartzite. The mean size in the former two categories is <13mm, in the latter >34mm. Only one silcrete scraper is reported. The large size of the quartzite scrapers led Inskeep (1987) to suggest that they were used to perform different functions from the smaller scrapers. After 3300 B.P. quartzite scrapers dominate and small scrapers in fine grained materials are virtually absent. Of the 40 segments recovered all are of chalcedony and predate 3300 B.P.. One retains traces of mastic suggesting hafting. An unusual component are the 8 backed scrapers which date to around 4500 B.P.

Similar tools are recorded from only a few other sites all situated to the west of Nelson Bay. These sites are Matjes River (Hoffman 1958; Louw 1960; Dockel 1998) and Byneskranskop (Schweitzer & Wilson 1982), and a small number may be present at Oakhurst (Schrire 1962). At Matjes River

(Louw 1960) the range of tools in Layer C are more varied than in the mid-levels at Wilton and include more saws, lance heads, more bone tools, shell ornaments and painted grave stones. The largest numbers of backed scrapers (>10,000) are reported from undated surface collections made by C.H.Heese (n.d.) in the 1930s at the open site, Brakfontein, located 12 km from the coast and 20 km to the north-west of the Blombosfontein Nature Reserve sites. Over 30,000 LSA artefacts which include large numbers of small scrapers, segments and adzes were collected but these have yet to be formally studied.

Broad similarities in the trajectory of artefact change in the Mid/Later Holocene are evident, but there is considerable variation between inland and coastal assemblages, and also between sites in the western and eastern zones of the southern Cape. This agrees with H.J. Deacon's (1976:171) observations

> ... artefact occurences to the west of the Gouritz River fall outside any concept of a specific Wilton content unit

Apart from the lithics a wide variety of tools, decorated items, ornaments and grave goods have been recovered from mid-Holocene sites (Inskeep 1987; Jerardino & Yates 1996; Deacon & Deacon 1999). Bone tools include arrow points, foreshafts and linkshafts, 'spoons', spatulas, and fish hooks. A variety of beads, pendants and other ornaments are made in shell, stone and bone. Ostrich egg shell containers and fragments are sometimes decorated, tortoise shells are worked to form bowls and scoops. Due to the excellent preservation of organic materials at some sites a range of items in leather, wood and plant fibre have been recovered. These include wooden digging sticks and pegs, fire sticks, bows, arrows, fragments of sewn leather and rope/netting. A few artefacts mounted in mastic provide clear evidence of the hafting of microlithic tools (Maingard 1932; Goodwin 1938; Louw 1960; Wells 1965; van Noten 1974; Deacon, H.J. 1976; Deacon, J. 1984a, b, 1990; Inskeep 1987; Deacon & Deacon 1999; Mitchell 2002).

Burials may be accompanied by a range of grave goods including grindstones/ hammerstones, painted stones, palettes, bone awls, ornaments such as beads and pendants, ochre pencils and powdered ochre, tortoise carapace bowls (e.g. Louw 1960; Rudner 1971;Voigt 1972; Deacon, H.J. 1979:69-70; de Villiers & Wilson 1982; Inskeep 1987; Hall & Binneman 1987; Deacon & Deacon 1999; Jerardino *et al* 2000; Sealy *et al* 2000). Grave goods are most commonly found associated with burials in the southern and eastern Cape, and although the symbolic significance of these is not understood it may illustrate social differences between people in this area and those in the south-western Cape (Hall & Binneman 1987; Binneman 1999).

Subsistence strategies broaden in the Holocene to include a wide range of 'small' food parcels (Henshilwood 1997) and may be related to both higher population densities and available resources (Henshilwood 2001a). At most sites large bovids are rare; one exception is the Uniondale site in the eastern Cape where large numbers of Cape Buffalo have been recovered (Brooker 1989). In the Wilton layers at Nelson Bay Cave the emphasis is on smaller terrestrial animals, especially small bovids (Klein 1973; Inskeep 1987), a pattern repeated at a number of other sites including Wilton Rock Shelter, Melkhoutboom, Andrieskraal I, Kangkara, Boomplaas, Matjes River and Oakhurst (Goodwin 1933, 1938; Louw 1960; Deacon & Deacon 1963; Deacon, J. 1965, 1972; Deacon, H.J. 1976, 1979; Deacon, J. 1984a).

With the mid-Holocene rise in sea temperature, *Perna perna* replaces *C. meridionalis* at Nelson Bay. A wider range of molluscs from the whole intertidal zone are also represented including *Patella sp., Haliotis sp., Turbo sarmaticus, Diloma sp., Donax serra* and *Burnupena* (Inskeep 1987). Klein (1973, 1999) suggests this is due to greater efficiency at cropping marine resources, or simply not minding getting wet, and not to environmental changes. It is interesting to note that at the Andrieskraal I site, situated 50km from the coast in the Gamtoos River Valley, shells from these same species were recovered, suggesting that coastal resources formed a part of the occupants subsistence strategy (Hendey & Singer 1965; Deacon, J. 1965, 1974). At around 3000 B.P. a similar molluscan species composition is evident at the Gordon's Bay shell midden with the exception of the continued presence of *C. meridionalis.* On the western Cape coast at Eland's Bay there is an hiatus in occupation between 7800 - 4400 B.P., possibly due to low rainfall and higher sea levels, but thereafter marine molluscs are heavily exploited, particularly *C. meridionalis* but also limpets and whelks (Parkington 1987; Parkington *et al* 1988). Between 3000 and 2000 B.P. isotopic measurements on skeletons indicate a marked emphasis on marine resources. Megamiddens, very large shell middens, are present on the west Cape coast during this time period. Support for the isotopic evidence comes from Pancho's Kitchen Midden, as site that contains rich shellfish deposits dating to between 3000 and 2000 B.P. (Jerardino 1998). A stretch of coast, south of Eland's Bay on the west Cape coast, show abundant occupation of sites on the rocky coast after 3000 years ago but with few sites where sandy shores occur (Jeradino 2003).

By the Mid-Holocene the proportions of marine species, which includes fish, birds and mammals increases rapidly in relation to terrestrial fauna at Nelson Bay Cave. Technological innovations include fish gorges and net sinkers and the application of these is evident in both the species variety and numbers of fish caught at Nelson Bay (Klein 1973; Inskeep 1987). Large numbers of fish bones were also recovered at Oakhurst (Goodwin 1933, 1938) and fish remains are mentioned at Matjes River (Hoffman 1958; Louw 1960; Dockel 1998).

Systematic collection of a range of plant foods, particularly geophytes, is evident at a number of inland sites in the southern Cape, but are virtually absent at coastal sites (Deacon & Deacon 1999). It seems unlikely this is due to preservation as seaweed bedding is found at Eland's Bay and at

Hoffman's Cave, and milkwood seeds at the Gordon's Bay shell midden (van Noten 1974). At coastal sites the dietary emphasis appears to be on shellfish rather than plant foods, although plants foods may be present (Parkington 1972, 1976, 1987; Deacon 1972; Klein 1973, 1999; Jerardino 1998, 2003; Deacon & Deacon 1999; Mitchell 2002; Sadr *et al* 2003; Henshilwood & van Niekerk 2006). Common species at the inland Melkhoutboom site include the geophytes *Watsonia* and *Hypoxis* (Deacon & Deacon 1999). At the time of new growth during May/June the corms of these plants are unusable and H.J. Deacon (1976) suggests this period may have coincided with coastal visits (also *cf.* Parkington 1972, 1976; 2001).

4.4: The Late Holocene (2,000 B.P. - Historic Period):

Perhaps the most characteristic feature of this period is the arrival of a new economic system at the Cape, namely animal husbandry (Epstein 1937). In the historic period the widely dispersed Khoe groups in South Africa all spoke similar dialects which have linguistic affinities to the Central Bush family of languages spoken by hunter gatherers in northern Botswana and south-western Zimbabwe (Westphal 1963). Based on ethnographic data and Westphal's linguistic evidence, Elphick (1977) proposed two alternative routes for the arrival of pastoralists in the Cape. The initial movement was from northern Botswana towards the Orange River. One element continues along the Orange River in a westerly direction to the Atlantic coast, then south to Namaqualand and finally to the western Cape; the other continues south through the Central Karoo. Earlier, Cooke (1965) had proposed similar origins but favoured the western coastal route. However, there are problems with the linguistic evidence as most Khoe had been decimated before their language was adequately documented (Inskeep 1978; Deacon, J. 1984b; Klein 1986; Smith 1986).

An alternative scenario is that a variety of routes were followed at different times and that consequently there were multiple introductions of livestock to the Cape. Sheep may have been introduced at around 2000 B.P. via the west coast route, but cattle could have been obtained from Iron Age people on the east coast and only brought to the southern and western Cape at a later date (Klein 1986; Sealy & Yates 1994; Henshilwood 1996). Archaeologically we would therefore expect earlier dates for sheep on the west coast but some of the earliest associated radiocarbon dates come from the southern and south-western Cape sites of Die Kelders (1960 ± 85 B.P.), Nelson Bay Cave (1930 ± 60 B.P.), Byneskranskop (1880 ± 50 B.P.) (*cf.* Schweitzer 1974, 1979; Schweitzer & Wilson 1982; Klein 1986) and 1960 ± 50 B.P. at Blombos Cave (Henshilwood 1996). At the west coast site, Kasteelberg A, sheep may date to 1860 B.P. (Smith 1986).

Sealy and Yates (1994) argued that the dates for sheep at the above sites are based on indirect dating, that is by association of faunal materials with recovered charcoal from within stratigraphic layers. Direct accelerator radiocarbon dating of sheep bone from six sites in the western and south-western Cape produced a younger set of dates; Kasteelberg A 1630 ±60 B.P. & 1430 ±55 B.P., Die Kelders 1325 ±60 B.P. & 1290 ±60 B.P. and Byneskranskop 1370 ± 60 B.P. The oldest dates are from Spoegrivier in the north-western Cape at 2105 ± 65 B.P. The results, they argue, point to a lack of evidence for stock-keeping in the southernmost Cape prior to 1600 B.P. and tentatively suggest a southerly movement of stock may be detected.

Two samples of sheep bone, excavated from BBC, layers 5 & 6 were submitted for accelerator radiocarbon dating. The dates obtained, 1880 ± 55 B.P. and 1960 ± 50 B.P. (Henshilwood 1996) contradict the Sealy & Yates (1994) model for a 1600 B.P. date and indicate that sheep were present in the southern Cape at around 2000 B.P. (*cf.* Chapter 7).

The wild ancestors of domestic stock - sheep and cattle - originated in north-eastern Africa or south-western Asia. Goats were unknown in the southern and south-western Cape during the prehistoric period and there is no evidence of any indigenous species of animals being domesticated by the Khoe. Klein (1986, 1999) suggests this is clear evidence that the herding concept was introduced to the Cape from elsewhere, but whether this introduction was through a process of diffusion or through the migration of herders colonising new areas is unclear. Support for the latter model is provided by Smith (1986, 1990a) and Smith *et al* (1991) who argues that pastoralism is a coherent strategy which requires specific social relations between people and animals and that consequently the egalitarian ethic practised by hunter gatherers was not consistent with the economics of animal husbandry (Epstein 1937). A combination of both migration and acculturation by resident hunter gatherers is recognised by some archaeologists as a more plausible explanation (*cf.* Denbow 1984; Schrire 1984, 1992; Klein 1986, 1999; Sadr *et al* 2003). It seems likely, therefore, that by the historic period Khoe ancestors could be traced to both indigenous people and migrant groups, but clearly there still were, and possibly always had been, separations both economically and socially between the San and Khoe (*cf.* Parkington 1984; Parkington & Mills 1990; Deacon & Deacon 1999; Mitchell 2002).

Recognising the Khoe/San distinction in the archaeological record has proved problematic as herders and hunter gatherers, despite their economic differences, also shared many cultural and physical characteristics, and the occupation site residues left by both appear very similar (*cf.* Schweitzer 1974, 1975; Klein 1986; Smith *et al* 1991, 2001; Deacon & Deacon 1999; Sadr *et al* 2003). The general range of tools, ornaments and other cultural materials found in the Mid/Late Holocene persist in the post-pottery period and there is generally sparse evidence of artefacts specifically linked to a herding economy. At some sites, however, the evidence for the presence of herders may be more convincing, for example at Bloeddrift 23 situated in the Richtersveld (Smith *et al* 2001. Wooden or grass bowls and containers would provide convincing evidence as these were used by the Khoe for storing milk but archaeologically these items seem invisible (Deacon 1984b; Deacon & Deacon 1999).

Stone artefact traditions show broad continuity at a number of sites after the arrival of the Khoe. At Boomplaas microlithic artefacts continue to be manufactured during the Late Holocene and are found associated with pottery (Deacon, H.J. 1978, 1979; Deacon & Deacon 1999). Some changes are evident at coastal shell middens after 2000 B.P. where flaked quartzite cobbles and large, unretouched flakes become more common, although this trend towards larger quartzite tools is evident at the Gordon's Bay Midden before 3000 B.P. (van Noten 1974). Formal tools are absent, or near absent, at some coastal sites (e.g. Deacon & Deacon 1963, 1999; Avery 1974; Robertshaw 1977, 1979; Jerardino 1998; Henshilwood & van Niekerk 2006). A comparison of the pre-pottery and post-pottery assemblages shows the most common differences are a reduction in the frequency of microlithic backed tools, especially segments, and decreasing use of fine grained raw materials (Deacon 1984b; Mitchell 2002; Sadr *et al* 2003).

The introduction of pottery at the Cape is generally associated with the arrival of the first pastoralists, although some authors note that early pottery dates are more common than those for sheep (Deacon 1984b, Klein 1986). Based on a date of 1600 B.P. for the introduction of livestock to the southernmost Cape, and on secure pottery dates clustered around 2000 B.P. from a number of sites, Sealy and Yates (1994) speculate that the arrival of pottery may predate pastoralism. Pottery is found in Layer L5 at BBC in association with sheep bone radiocarbon dated at 1960 ± 50 B.P. suggesting that the introduction of pottery to the Cape does coincide with that of stock (Henshilwood 1996). Klein (1986, 1999) notes that in every assemblage with domestic stock, pottery is present. Although pottery does occur in the absence of domestic stock, Klein suggests this is due to sampling error as a result of the small size of the faunal sample.

Distinguishing Khoe and San sites on this basis would thus seem to be clear cut, but this is not the case. Historically, it is known that part of the enmity between San and Khoe was due to hunters stealing cattle and sheep from herders (*cf.* Raven-Hart 1967), and livestock remains may occur at both herder and hunter gatherer San sites. Pottery was used, and possibly made by the Khoe and San (*cf.* Schapera 1926, 1933).

One method suggested by Schweitzer (1974) for resolving this issue is to examine the sex and age of domestic stock. At the Die Kelders site, Schweitzer found that 78% of the 23 sheep in Layer 2 (Radiocarbon dates 1465 B.P & 1600 B.P.) were juveniles and predominantly male, and 3 were more than 4 years old. Based on the assumption that in order to maintain a successful breeding herd, only the young males or old animals would be slaughtered by the Khoe, he concluded that Die Kelders was a Khoe site. If the assemblage had, on the other hand, been composed mainly of ewes, this may suggest the sheep were stolen by San people. Domestic stock samples of this size are very rare however, and we have no record of the sex/age composition of Khoe flocks. However, the dietary elements in the layers which contain sheep at Die Kelders, are the same as those found in the lower pre-stock levels, and include dune mole rats, tortoises, small antelope, seals, marine birds, fish and molluscs (Schweitzer 1974). On the basis of a lack of clear evidence for a Khoe presence, and the physical inaccessibility of the site to herders with stock other authors believe that Die Kelders was occupied by San who were simply proficient at stealing or bartering sheep from the Khoe (Avery, G. 1976; Wilson pers. comm.).

On the basis of the rarity of domestic animal bones, Klein (1986, 1999) suggests that in the Late Holocene Eland's Bay Cave, Nelson Bay Cave, Byneskranskop 1 and Die Kelders were primarily used for hunting and gathering, perhaps seasonally, but may also have been used for brief periods as herder bases. The abundance of stock at Kasteelberg (Smith *et al* 1991; Sadr *et al* 2003), and the calcined dung layers at Boomplaas (Deacon *et al* 1978; Deacon & Deacon 1999), suggests these sites were primarily occupied by herders.

Structural features such as kraal remnants and site location may also provide further evidence of the identity of the occupants (Klein 1986, 1999). Differences in the style of shelters used by the San and Khoe at open sites may also be archaeologically visible. Historical and ethnographic accounts show that the Khoe lived in portable, dome shaped shelters. These were constructed of a wooden framework and covered by woven mats and could be dismantled and carried on the backs of oxen when moving (Deacon & Deacon 1999). The San constructed small windbreaks of brush, sometimes thatched with grass, which in fine weather were fairly insubstantial but during the rainy season were more sturdily built (Schapera 1930, 1933; Raven-Hart 1971; Parkington & Mills 1991; Mitchell 2002). Being constructed of organic materials, the shelters of both Khoe and San are archaeologically invisible and would have caused minimal disturbance to the local environment. The remains of some habitation features have been preserved, notably where stone was used for anchoring these structures. Avery (1976) suggests that stone features at Pearly Beach shell middens indicate the positions of past structures.

Spatially mapping the extent and nature of surviving debris may serve to mark out the focal points of domestic activities, and the position of hearths or hearth stones may serve as site 'anchors' around which the likely positions of other features, including shelters, can be estimated (*cf.* Hodder 1987; Kent & Vierich 1989; Henshilwood 1990; Nicholson & Cane 1991; Deacon & Deacon 1999; Smith *et al* 2001). In this regard ethnoarchaeological studies among contemporary hunter gatherer peoples may provide us with useful analogues (Gorecki 1988; Solway & Lee 1992). Khoe camps consisting of a few hundred people were recorded historically in the Cape (Raven-Hart 1971), but few archaeological traces of these have been found.

Early contacts made between herders and hunter gatherers at the Cape might have been amicable, but in later periods this was clearly not the case. Gradually increasing demands made on the environment by Khoe stock led to a reduction in available grazing and hence the ungulate population in some areas. As Khoe wealth increased there was greater disparity between them and the San, and as both groups utilised the same diminishing natural resources this led to competition and conflict between Khoe and San, but also amongst the hierachically controlled Khoe groups. San raids on Khoe stock led to retaliatory attacks and open warfare on hunter gatherers, forcing the San into refuge situations in the Cape Folded Mountains and the more remote coastal areas (Parkington 1984; Smith 1986; Hall 1986; Deacon & Deacon 1999; Mitchell 2002). The effects of this probably disrupted traditional San seasonal subsistence rounds and reduced the size of bands. Coincidentally the number of sites situated in small shelters in the inland Cape Folded Mountains increases considerably in this later period (Hall 1986; Parkington 1987; Parkington *et al* 1988). As the coastal plains were favoured for grazing Khoe stock (*cf.* Hall 1986; Smith 1986; Smith *et al* 1991; Sadr *et al* 2003), San visits to the coast may have become less frequent or timed so as not to coincide with Khoe rounds. Related to this may be a greater use of small coastal caves by hunter gatherers and a reduction in the occupation of open coastal sites (Parkington 1984; Deacon & Deacon 1999).

A strong relationship between site location and date of occupation, observable at BBF, may reflect the trend towards a greater use of small shelters by hunter gatherers in the Late Holocene. Only sites which predate 2000 B.P. are in open locations on the coastal foreland, those later than 2000 B.P. are situated in small shelters in the coastal cliffs, although, as mentioned earlier, a reduction in vegetation cover in the BBF dune area may also be a relevant factor.

4.5: Summary

In this chapter the archaeology of the southernmost Cape is reviewed as a background to understanding and interpreting the events which occurred at the nine Holocene sites excavated at BBF. Holocene lithic traditions follow distinct temporal patterns throughout the region although some local variations are recorded. Major changes in stone tool traditions occur at around 8000 B.P. and again at 3000 -2000 B.P., but are not linked to environmental changes.

Excavated sites at BBF date to the period between 7000 B.P. and 300 B.P. At about 8000 - 7000 B.P. a change in lithic traditions occurs at the Cape with the replacement of the Albany Tradition by the Wilton Tradition. Characteristic of the Wilton are small scrapers, segments and some backed elements in fine grained raw materials. The trajectory of lithic change is broadly consistent at a number of southern Cape sites although some coastal sites reflect considerable variation from the Wilton site pattern. Comparison of coastal lithic assemblages with those from the early BBF sites is therefore of particular interest. Coincident with the arrival of herders and pottery at around 2000 B.P. the Wilton tradition is in decline although at some sites microlithic artefacts continue to be manufactured and are found in association with pottery. A comparison of the lithics from the pre- and post 2000 B.P. sites at BBF is made in Chapter 8 and confirms the Late Holocene decline in microlithic tools.

A wide variety of cultural artefacts including bone tools, decorative items in shell, stone and bone, leather items and wooden tools have been recovered from Mid-Holocene sites. Burials may be accompanied by a range of grave goods, particularly in the southern and eastern Cape.

Subsistence in the mid-Holocene is based on a broad range of resources consisting mainly of 'small' food parcels. Large bovids are rare and at coastal sites the proportion of marine species increases relative to terrestrial fauna. The wide range of molluscs found at coastal sites also occurs at BBF indicating exploitation of the whole intertidal zone. Fish bones are also common and a wide range of species are reported.

The advent of pastoralists at the Cape marks the start of the Late Holocene period and a sheep bone from BBC, dated at 1960 ± 50 B.P., is the earliest evidence for the arrival of livestock in the southern Cape. Based on the direct radiocarbon dating of sheep bone from a number of Cape sites, Sealy and Yates (1994) recently proposed that 1600 B.P. may be the earliest date for the arrival of herding groups in the region. They also propose that pottery, dated at around 2000 B.P. may have preceded the introduction of livestock but this is contradicted by the evidence at BBC as pottery is found in the same layer as the dated sheep bone (Henshilwood 1996).

Recognising the presence of hunter gatherer or herder groups from the archaeological record at the Cape is the subject of ongoing debate. Few cultural markers are specific enough for a clear distinction to be made. Similar problems are encountered in determining the identity of the later occupants at BBF sites. However, the inaccessible location and small size of the post 2000 B.P. sites at BBF strongly suggests they would not have been suitable for habitation by herders with livestock and were therefore probably occupied by San hunter gatherers. A fuller discussion of this proposal follows in Chapter 7.

CHAPTER 5

SITE DESCRIPTIONS AND RADIOCARBON DATES

5.1: Introduction

During 1990 and 1991 a 60 km section of the southern Cape coastline, between the Breede River and Still Bay, was surveyed for archaeological sites. West of the Breede River a 10 km section of coast situated within the De Hoop Nature Reserve, was also surveyed in 1991 and a further 20 km within the reserve was survey by the author during 2002 - 2008. Blombosfontein Nature Reserve was chosen as the most suitable area for further investigation. Nine of the Holocene sites at BBF met with the objectives of the project and were selected for excavation (Fig. 5.2). During the period October 1992 to February 1993 the chosen sites were surveyed and excavated.

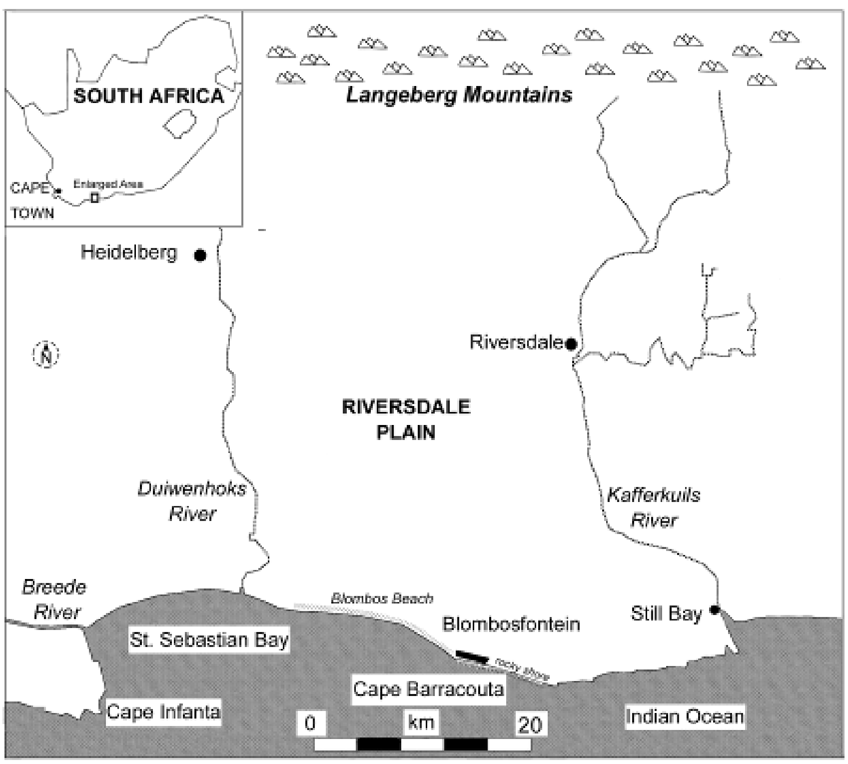


Fig. 5.1. Riversdale Plain and Blombosfontein Nature Reserve

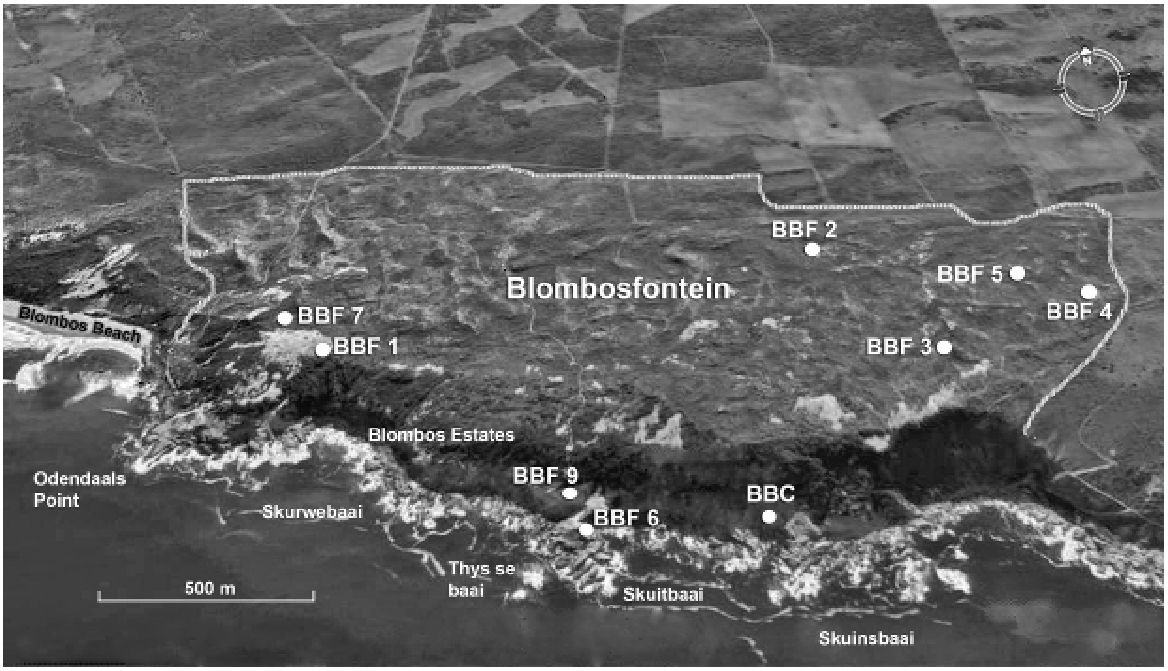


Fig. 5.2. Blombosfontein Nature Reserve and Blombos Estates indicating position of excavated sites BBF 1,2,3,4,5,6,7,9 and BBC

Based on detailed field notes and photographs taken during excavation a description of each site, its stratigraphic units and location are recorded below. All the recovered material was taken to the University of Cape Town for sorting, analysis and where necessary, measurement. Expert advice was sought in the analysis of terrestrial fauna, microfauna, some species of marine shell and fish bones. Cultural artefacts were separated by raw material and category, described and measured. Sediment samples, collected from three sites at BBF, were submitted for textural analysis.

Shell and charcoal were collected *in situ* for radiocarbon dating during the excavation of sites at BBF and sixteen samples submitted to the CSIR, Pretoria. Additionally, two sheep bones, excavated at BBC, were sent to the Oxford University radiocarbon accelerator unit for dating.

5.2: Survey Methods and Site Selection

In order to suit the objectives of the project certain selection criteria were applied to all the sites recorded in the De Hoop Nature Reserve in 1991 and to those situated between the Breede River and Still Bay to assess their suitability for excavation:

(i) Age of sites: A temporal cross-section of Holocene sites was required for excavation; exposed lithics, particularly in open sites, were used to aid initial dating estimates; lithics and pottery, excavated from a 1 m deep test pit at BBC in June 1992, were also available as dating guides.

(ii) Location of sites: All the sites chosen for excavation should ideally fall within a 10 sq. km radius and be located on or near the coast. This aim of this requirement was to gain spatial control over the likely extent of the foraging zone utilised by the sites inhabitants, thereby enhancing the comparability of inter-site data. Open and cave or shelter sites were sought in order to obtain variability in site types.

(iii) Number of sites: Enough sites were needed to demonstrate diversity, but not more than could be excavated or analysed in the time available; a sampling strategy for each site would determine the size of an excavation.

(iv) Site content: At least a part of the assemblage of each site selected had to be *in situ* and considered homogeneous; the effects of diagenesis at each site were taken into consideration.

As a result of the survey more than sixty open, cave and shelter sites were recorded along the coastline. Many of these sites were well preserved and suited to some of the requirements of the project, however the distance between sites was often large. It was also difficult to gauge the age and extent of the archaeological deposits in cave sites as a limited time schedule precluded the possibility of excavating sample trenches at these sites. Some of the open middens were well preserved and considered suitable for excavation, others were no longer *in situ,* too small, or contained deposits of mixed age.

Blombosfontein Nature Reserve was considered the most promising area for further investigation. An aerial photograph of BBF was gridded in 50 m wide sections and a detailed physical survey carried out in each transect. Of the 21 LSA sites noted, 9 were selected for excavation. For record purposes a copy of the BBF survey was submitted to the Iziko-South African Museum.

5.3: Excavation Procedures

During October, 1992 the 9 selected sites were surveyed, measured and drawn. Where practicable, the extent of *in situ* deposit and of talus material was noted for each site, base lines fixed and the area to be excavated was established.

Excavations at BBF commenced in early November 1992. A grid of 1 x 1 m squares was laid down at a site to be excavated. During excavation, features such as hearths were mapped in a horizontal and vertical plane. At five sites, BBF 1-5, the deposit seldom exceeded 5 cm in depth; each assemblage was considered to be a homogeneous single occupation unit. Three sites, BBF 6-9, and BBC had multiple episode deposits and were excavated in individual, stratigraphic units; exposed sections were plotted. Samples of shell or charcoal were taken *in situ* from all sites for radiocarbon dating; soils were also sampled. Site notes were kept, slides taken and the progress of each excavation recorded on videotape.

Recovered material was sieved in a 1.5 mm sieve. Some elementary sorting of shell, bone and stone took place on site; generally the unsorted, sieved residue was bagged for later sorting and analysis in the laboratory.

At the completion of the excavation of a site, the exposed areas were protected, either by backfilling in the case of open sites, or by lining the walls with sand-filled polythene bags in the case of the BBC site.

Excavations at all nine sites were completed by the end of February 1993. A total of 140 sq. m. comprising 66 individual units, was excavated. The gross mass of recovered material, after sieving, was 1425 kg, comprising in broad categories: marine shell, 662 kg; stone 366 kg; residue 296 kg; bone 90 kg; ostrich egg shell and other 11 kg.

5.4: SITE DESCRIPTIONS and Stratigraphy

Six of the open sites, BBF 1-5 and BBF 7 are located on a coastal foreland in the BBF dunefield and are elevated at between 90 m and 165 m a.s.l. The direct distance of these sites from the coast varies between 180 m and 1000 m. Three sites, BBF 6 and 9 and BBC are situated on the seaward side of the coastal cliffs less than 50 m from the sea and comprise, respectively, an open midden, a cave and a shelter. Figure 5.2 indicates the location of each excavated site at BBF.

Sites are numbered from oldest to youngest, thus BBF 1 is the oldest and BBF 9 the youngest. The BBC LSA deposits fall between BBF 9 and BBF 7. Radiocarbon dates for each site are listed below in Section 5.7, Table 5.4 & 5.5.

BBF 1 ($34^0$24’31.18 S $21^0$12’48.02 E)

Site Description (Fig. 5.3, 5.4)

Elevated at 90 m a.s.l., the entire BBF 1 site lies on a bed of aeolian sand, 80 - 100 cm thick. At the base of the aeolian sand is a calcretised hardpan surface The full extent of this site was not quantifiable as a 1.5 m layer of dune sand covers the surface; an estimate of the size is 22 m in a north-south direction and 9 m east-west. At the southern edge of the dune, heavily brecciated sections of deposit have been undercut by wind action and deposited on the talus slope, thereby exposing the site boundary. The entire visible deposit is encased in a hard calcretised breccia. As no stratigraphic differences could be observed within the breccia, BBF 1 is considered a single occupation unit .

In order to gain access to the underlying deposit a 3 m x 3 m platform was excavated at the southern end of the site by removing the overlying dune sand. Initially a 3 m x 2 m grid was laid out for excavation. Excavation commenced in Square A1.

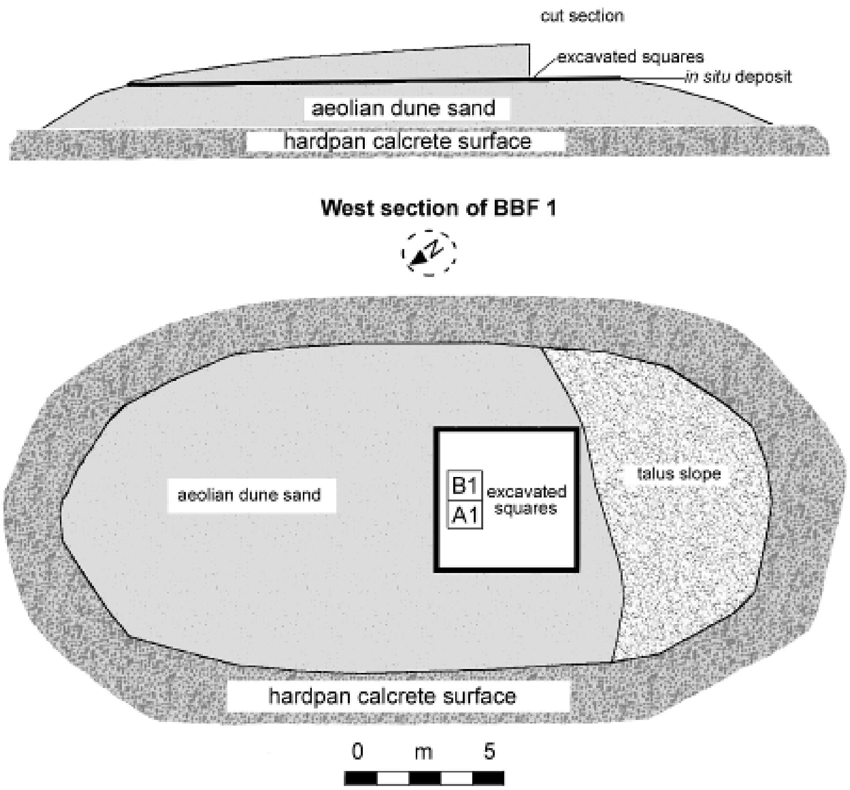


Fig. 5.3. West section of BBF 1 and the extent of the site

Fig. 5.4. View of site to north-east with squares A1 & B1 shown

Stratigraphy

Square A1

The surface of Square A1 was exposed by brushing. Slides and video footage were taken. On the surface a dense deposit of bone, in particular tortoise, and marine shell and stone were visible. A hard, calcareous matrix encased the deposit making the removal of individual artefacts difficult. A hammer and chisel were necessary to break up the deposit into manageable chunks. Throughout the square the thickness of the deposit was between 5 - 8 cm, but no individual stratigraphic units were observed within the excavated assemblage, nor in the cut and exposed sections.

Square B1

Square B1 was excavated in the same way as Square A1. A decision was taken not to excavate further squares at the site as it was uncertain whether a suitable method could be found for separating the breccia in the laboratory. The deposit was of a similar thickness to Square A1. At the conclusion of the excavation the site was backfilled.

BBF 2 (34^{0}24’29.54S 21^{0}13’48.24 E)

Site Description (Figs. 5.5, 5.6, 5.7)

Situated 1 km from the sea and elevated at 150 m a.s.l., the site extends for about 210 sq. m. The 16 sq. m of *in situ* deposit was encased in a soft, calcretised breccia and truncated by a forestry track. The western portion of the *in situ* section had been undercut by wind and water erosion causing a part of the original assemblage, possibly around 10 sq. m, to be deposited on the talus slope. Marine shells, bone, stone and ostrich egg shell were visible on the surface. Some preserved bone was evident but was generally friable and not easily identifiable to taxa. No stratigraphic differences could be detected within the deposit giving a strong impression that the assemblage represented a single occupation. Additionally the homogeneity of stone tool types and the relatively small size of the original site reinforces the impression that BBF 2 was occupied once only.

A grid of 14 m x 15 m was laid over the entire site which included the talus slope. All the *in situ* deposit was excavated, sieved and bagged. Additionally, a 15 m x 2 m wide transect running from squares J1 to K15 was laid out on the talus and all visible bone and stone collected.

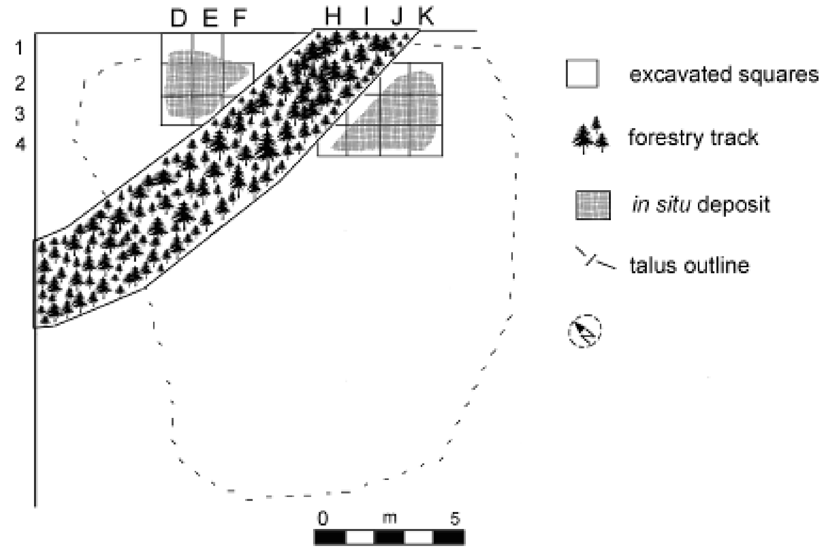


Fig. 5.5: Layout of BBF 2 site showing excavated area

Fig. 5.6. BBF 2: View of site to north with sieving and sorting in progress

Fig. 5.7. BBF 2: Close up view of site

Stratigraphy

The depth of the excavated deposit varied between 5 - 25 cm and was underlain by an aeolian sand bed. No stratigraphic layers could be discerned in any section of the deposit and the assemblage was considered homogeneous.

BBF 3 (34^{0}24'45.49 S 21^{0}13'55.10 E)

Site Description (Figs. 5.8, 5.9)

BBF 3 is elevated at 160 m and located 500 m from the sea. Three discrete areas of dense *in situ* deposit cover 55 sq. m. and contain shell, bovid and tortoise bone, ostrich egg shell, silcrete and quartzite in a medium density breccia. A further ± 1000 sq. m of thinly dispersed shell and stone is talus scatter. The site which extends for 30 m north-south and 35 m east-west was gridded in 4 m x 4 m blocks and six transects of 4 sq. m each were selected for excavation. The three *in situ* areas are regarded as dumps surrounding a central ashy section located in squares C 1- 4 and D 1- 4. Due to the homogeneity of all aspects of the deposit in the *in situ* areas, the whole site is regarded as a single occupational episode.

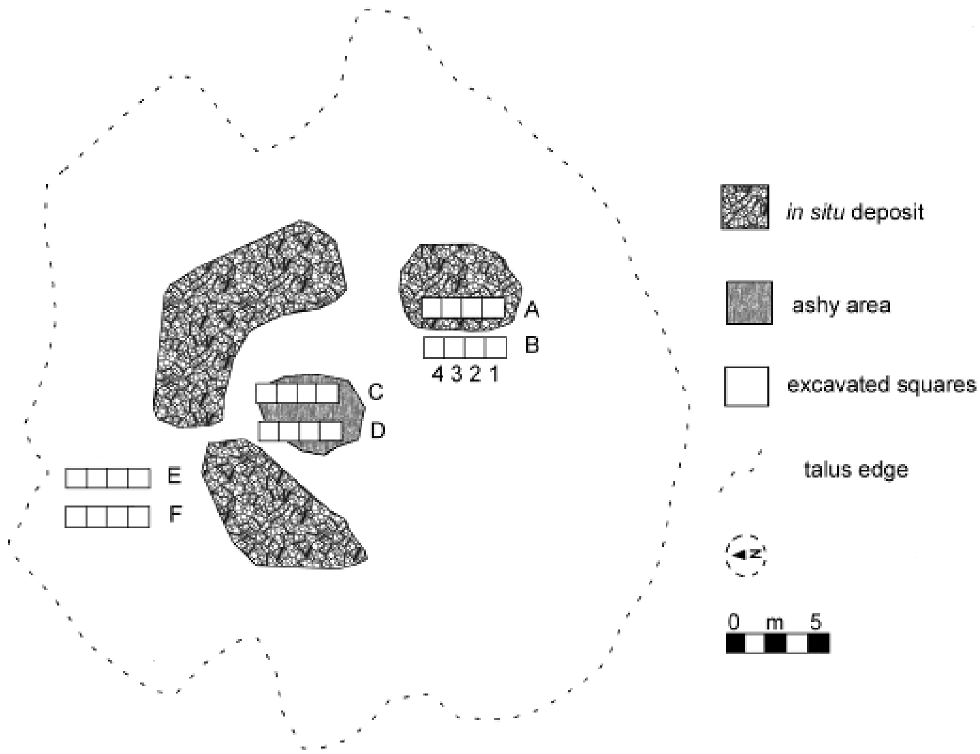

A
B
4 3 2 1
C
D
E
F
in situ deposit
ashy area
excavated squares
talus edge
N
0 m 5

Fig. 5.8: BBF 3 site layout showing excavated areas

Fig. 5.9. View of site to south showing marine shell on surface

Stratigraphy

Squares A 1- 4 are located within the eastern-most block of *in situ* assemblage and the deposit varies in depth from 5 - 12 cm. *Turbo sarmaticus* is the dominant shellfish in all the squares but *Patella sp*. and *Scutellastra tabularis* also occur. There is some bone, mostly tortoise, which is fragmented and a few larger pieces of badly weathered bovid bone.

Squares B 1-4 contain surficial deposits underlain by a compacted, sandy surface. The sandy matrix is grey in colour and some consolidation of the deposit may be due to the action of termites. In Squares C 1- 4 and D 1- 4 the maximum depth of deposit was 5 cm. The matrix in all these squares was ashy, and clear remains of a hearth were found in Squares C2 and D3. Small quantities of marine shell were present in all the squares, most of it fragmented as if having been trampled. This section of the site was possibly the central living area and the outer dense deposits may represent primary or secondary dumps.

Squares E 1- 4 and F 1- 4 are located on the talus slope and the recovered material was therefore not regarded as having being found *in situ*. The deposit in these squares consisted of a thin scatter of marine shell and stone, mainly quartzite, contained in a white dune sand matrix. No stratigraphic separations were observed in any of the squares excavated.

BBF 4 (34^{0}24'42.07 S 21^{0}14'15.93 E)

Site Description (Fig. 5.10, 5.11)

BBF 4, is the largest site at BBF, covering 2,500 sq. m. It is elevated at 160 m a.s.l. and is 800 m from the coast. Wind and water action have exposed most of the surface of the site. An *in situ* deposit of 400 sq. m, 5 - 10 cm thick, is underlain by a grey to black humic soil which also forms the surrounding matrix. White, aeolian dune sand underlies the remaining 2100 sq. m of talus scatter. Sand samples were taken from Squares BD 7 and BD 51 for textural analysis and the results are reported in Section 5.6 below.

Principal components of the site are marine shell and stone, predominantly silcrete with some quartzite. Microlithic backed scrapers and segments in silcrete are ubiquitous across the whole site. The homogeneity of the lithics and the intra-site spatial patterning, evident from the location of shell dumps on the periphery, and an ashy inner circle, suggests the site represents a single occupational episode. If the site was re-occupied this event, or events, are likely to have occurred within a similar time frame.

A 50 m x 50 m grid was laid out across the whole site and subdivided into 10 m x 10 m quadrants. Each quadrant was allocated a lettered code starting with AA in the north-west corner and ending with EE at the south-east end. In order to get a representative sample of the deposit a series of transects were selected for excavation and laid out across the site. In total 58 sq. m. was excavated; of these 10 sq. m were located on the outer talus slope, 10 sq. m on the inner talus edge and 38 sq. m. within the *in situ* area.

Stratigraphy

Quadrant AE

The density of the deposit in this quadrant is fairly sparse, on the surface only, and underlain by white aeolian dune sand. Five squares, AE 51- 91, were excavated.

Quadrant BD

Squares BD 1- 91 on the west side of the quadrant were excavated. A medium density scatter of deposit covers the surface in all these squares. As the underlying matrix in the western section of the quadrant is white, aeolian sand the deposit here is regarded as talus material. In Squares BD 2-10 the underlying soil is dark grey to dark brown with a thin layer of white aeolian sand on the surface, and the material here is considered *in situ*. Shell, stone and a small amount of weathered bone was recovered in Squares B 2-10.

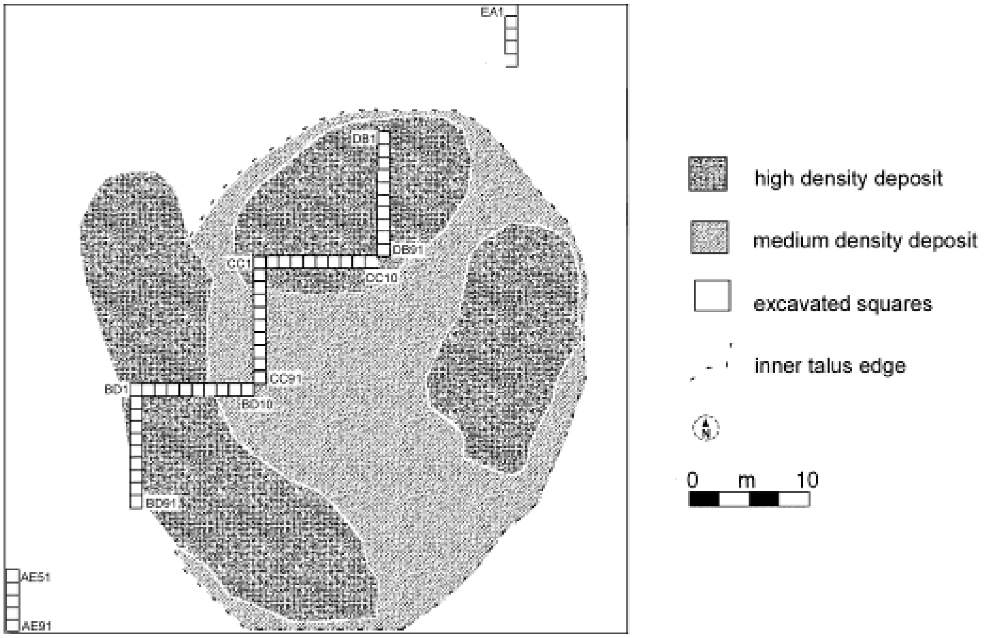


Fig. 5.10. Layout of BBF 4 site showing excavated areas

Fig. 5.11. View of BBF 4 site to north showing shell and lithics on surface

Quadrant CC.

In Quadrant CC the deposit was recovered from the surface or just below it. The matrix and underlying soil is dark grey, light grey or brown and is ashy in parts. Two rows of squares were excavated in this quadrant, CC 1- 10 and CC 11- 91.

Quadrant DB

One row of 10 squares, labelled DB 1- 91, were excavated. A high density of *Turbo sarmaticus* shells was visible in the surface deposit and during excavation a number of *Turbo* were located below the surface. In Square DB 51, a hard ashy surface was exposed and although an absence of charcoal suggests this feature was not a dense hearth, it may represent a shallow fireplace. The matrix in the surrounding area is very ashy, mostly light to dark grey or brown. A hardish crust of darker soil underlies the excavated squares.

Quadrant EA

Five squares, EA 1-41 were excavated in the north-east corner of the quadrant. A thin scatter of deposit covers the surface. The deposit in this quadrant lies on the talus slope and is underlain by white aeolian dune sand. No distinct separations in the deposit were visible in any of the excavated squares and consequently the excavated assemblage was regarded as a single stratigraphic unit.

BBF 5 (34^{0}24’37.41 S 21^{0}14’23.99 E)

Site Description (Fig. 5.12, 5.13)

The BBF 5 site consists mostly of a thin scatter of exposed shell and stone extending for 550 sq. m down the slope of a stabilised dune. Situated 900 m from the sea the site is elevated at 165 m a.s.l. At the centre of the site, 18 sq. m of the densest deposit, regarded as being *in situ*, was selected for excavation. The southern end of the site, below the excavated area, represents the talus slope as the material here was not *in situ*. A base line was laid out and an outline of the site mapped. In the area to be excavated a 6 m x 3 m grid was laid out.

A number of quartzite hammer stones and anvils and a dense concentration of *S. tabularis* and broken *T. sarmaticus* shells characterise the BBF 5 assemblage. Curiously, *T. sarmaticus* opercula, evident in abundance at other sites, are almost absent from BBF 5. The almost exclusive presence of *S. tabularis* and *T. sarmaticus* suggests that these two shellfish species were being specifically targeted and that BBF 5 may have been a shellfish processing site used during a single visit (see Henshilwood *et al* 1994). This issue is discussed more fully in Chapter 6.

Stratigraphy

All the excavated deposit lay on the surface surrounded by a yellow aeolian sand matrix. The maximum depth of deposit was 5 cm.

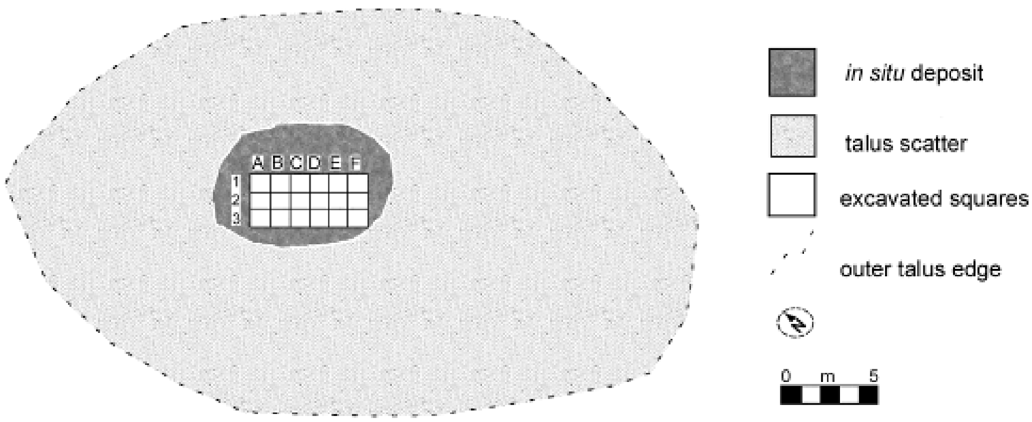


Fig. 5.12. Layout of BBF 5 site with excavated area

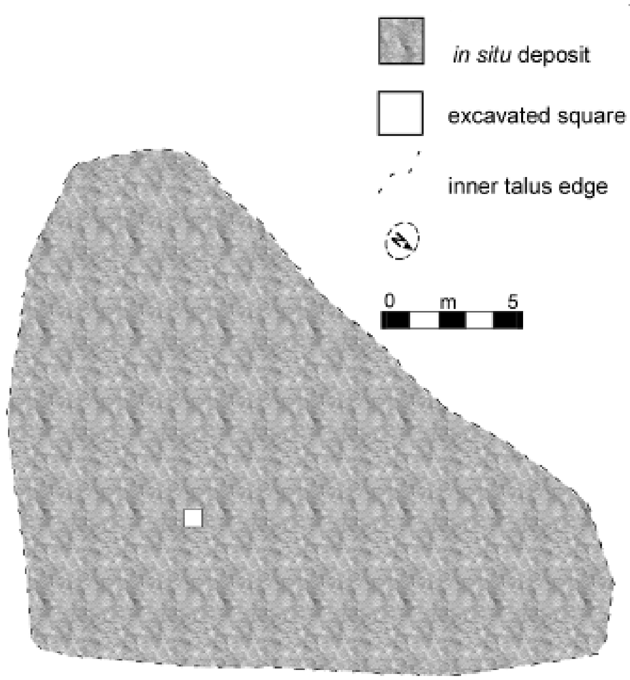
Fig. 5.13. Close-up of BBF 5 site with shell and lithics

BBF 6 (34^{0}24’54.30 S 21^{0}13’12.13 E)

Site Description (Fig. 5.14, 5.15, 5.16)

Situated on a rocky coastal promontory, 20 m from the waters edge, BBF 6 is a large midden covering over 500 sq. m. Marine shellfish are the major component of the BBF 6 site and only small quantities of fish bone and stone were recovered. The site had been repeatedly re-used, mainly it seems as a shellfish dump or processing area. Hearths are visible in some of the excavated units indicating that BBF 6 was also used as a shellfish cooking area. As the site offers no protection from the elements and is particularly exposed to the strong north-westerly and south-easterly winds, it seems unlikely it was used as an overnight campsite.

The north-west face of the midden had been eroded by wind and water exposing a 70 cm deep section of the deposit. In preparation for excavation this face was vertically cleaned. Due to the very high density of shellfish in the deposit a column section of 50 cm x 50 cm was chosen for sampling. Stratigraphic excavation yielded 12 discrete depositional episodes in a 1.3 m deep section, underlain by sterile aeolian dune sand. These units were subsequently numbered, from top to bottom, Layer 6/1 to Layer 6/12. Abbreviations for the original units are given below in brackets.



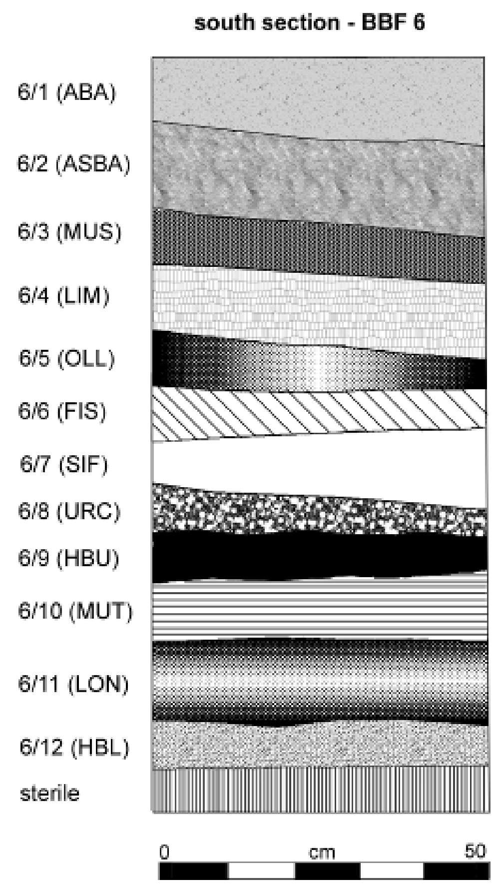


Fig. 5.14. Layout of BBF 6 site showing position of excavated square

Fig. 5.15. BBF 6 with excavated column

Fig. 5.16. Close up of BBF 6 site showing shells and ash lenses

Stratigraphy (Fig. 5.14)

Layer 6/1 (ABA)

The top layer was 10 cm in depth and contained a dense deposit of shell including *Turbo, Patella sp. Diloma sp*. and *Haliotis midae* in a yellow dune sand matrix.

Layers 6/2 (ASBA)

A radiocarbon date of 3630 ±70 B.P. was obtained on shell from this layer. It is very ashy with some charcoal and a hearth is clearly visible in the north side of the square with an ash layer 15 cm thick on the southern side and 8 cm thick in the north. Shell in this layer is generally fragmented and often burnt.

Layer 6/3 (MUS)

A matrix of yellow dune sand surrounds a dense shell layer approximately 5 cm thick.

Layer 6/4 (LIM)

On the surface of this layer is a hard, sandy deposit with numerous small inclusions which look like flaked bone. Some fish bone is also evident but shellfish dominates the whole layer. In the northern half of the square the deposit is 12 cm deep and 7 cm deep in the south.

Layer 6/5 (OLL)

Layer 6/5 is very dense shell layer, 5 - 7 cm thick, and sloping to the east with a lot of *Turbo* evident.

Layer 6/6 (FIS)

The deposit here slopes down to the north and east where it is respectively 10 cm and 5 cm thick. A number of *Cymatoceps nasutus* pre-maxillae and other fish bones are evident in this dense layer of shell.

Layer 6/7 (SIF)

This layer is composed mainly of shellfish and varies in depth between 6 - 12 cm. A small quantity of quartzite flakes were recovered. It is separated from the layer below by a thin lens of darker ashy soil.

Layer 6/8 (URC)

Mixed shellfish are evident in this layer which slopes to the east and is between 5 - 10 cm thick.

Layer 6/9 (HBU)

Layer 6/9 consists of a dense layer of shellfish and some bone in a charcoal and ash matrix overlying a sterile layer of yellow aeolian sand.

Layer 6/10 (MUT)

This is mostly a sterile layer of yellow sand with the occasional shell and represents an hiatus period between the layers above and below.

Layer 6/11 (LON)

A 10 - 15 cm layer of yellow sand with shell, less dense in the upper layers with more shell at the base, particularly *Patella sp.* and *Turbo*, characterises Layer 6/11.

Layer 6/12 (HBL)

Layer 6/12 consists of a dense layer of shell with black ash and charcoal, the latter was very soft and hence difficult to recover. The hearth extends beyond the square to the south, east and west. This is the lowest occupation layer and is radiocarbon dated at 4070 ±60 B.P. Layer 6/12 overlies a sterile layer of aeolian dune sand.

BBF 7 (34^{0}24’25.70 S 21^{0}12’44.65 E)

Site Description (Fig. 5.17, 5.18, 5.19)

BBF 7 is located 500 m from the coast and is elevated at 110 m a.s.l. The full extent of the site could not be determined as a layer of dune sand at least 1.5 m deep mantles the deposit. It is only at the southern end that a section of the BBF 7 site is exposed and eroded, resulting in ± 200 sq. m of fairly dense talus scatter.

At the southern end of the site a section of humic soil over 2 m deep is exposed; this was spade cut to obtain a clean section. It was evident from the exposed face that the uppermost deposit lies in a matrix of yellow sand directly on the surface of a dense, dark humic layer. Protruding marine shells were visible in the top 30 cm of the humic soil. A 3m x 3m grid was laid out above the southern face of the site and the overlying 1.5 m of sterile overburden removed.

As it was thought that a palaeovlei (small inland lagoon) might have been the source of the humic soil at the BBF 7 site a number of soil samples were taken from various sections in the exposed southern face. These samples were analysed to determine the size of the sand fractions, and for the presence of fresh water molluscs. The results are reported in Section 5.6 below.

Stratigraphy (Fig. 5.17)

The upper layer, 7/1 (YSL) was excavated across 9 squares numbered A1 - C3. A yellow, dune sand matrix enclosed the deposit composed of marine shell, bone, ostrich egg shell and stone. In all squares the deposit was 1 - 2 cm deep. Underlying this layer was a firm, compacted humic surface with no underlying deposit evident, suggesting that Layer 7/1 was deposited after the formation of the humic palaeosol.

Due to the compactness of the humic soil and consequent difficulty in excavating the three lower units it was decided to confine the excavation to three squares, B1 - B3. In the upper humic layer, 7/2 (HL1) a small amount of generally fragmented shell and some stone was evident and these were darkly stained, unlike the clean deposit in Layer 7/1. A clear distinction could not be made between Layers 7/2 and 7/3 and an arbitrary separation was made. The upper spit was 5 - 7 cm deep.

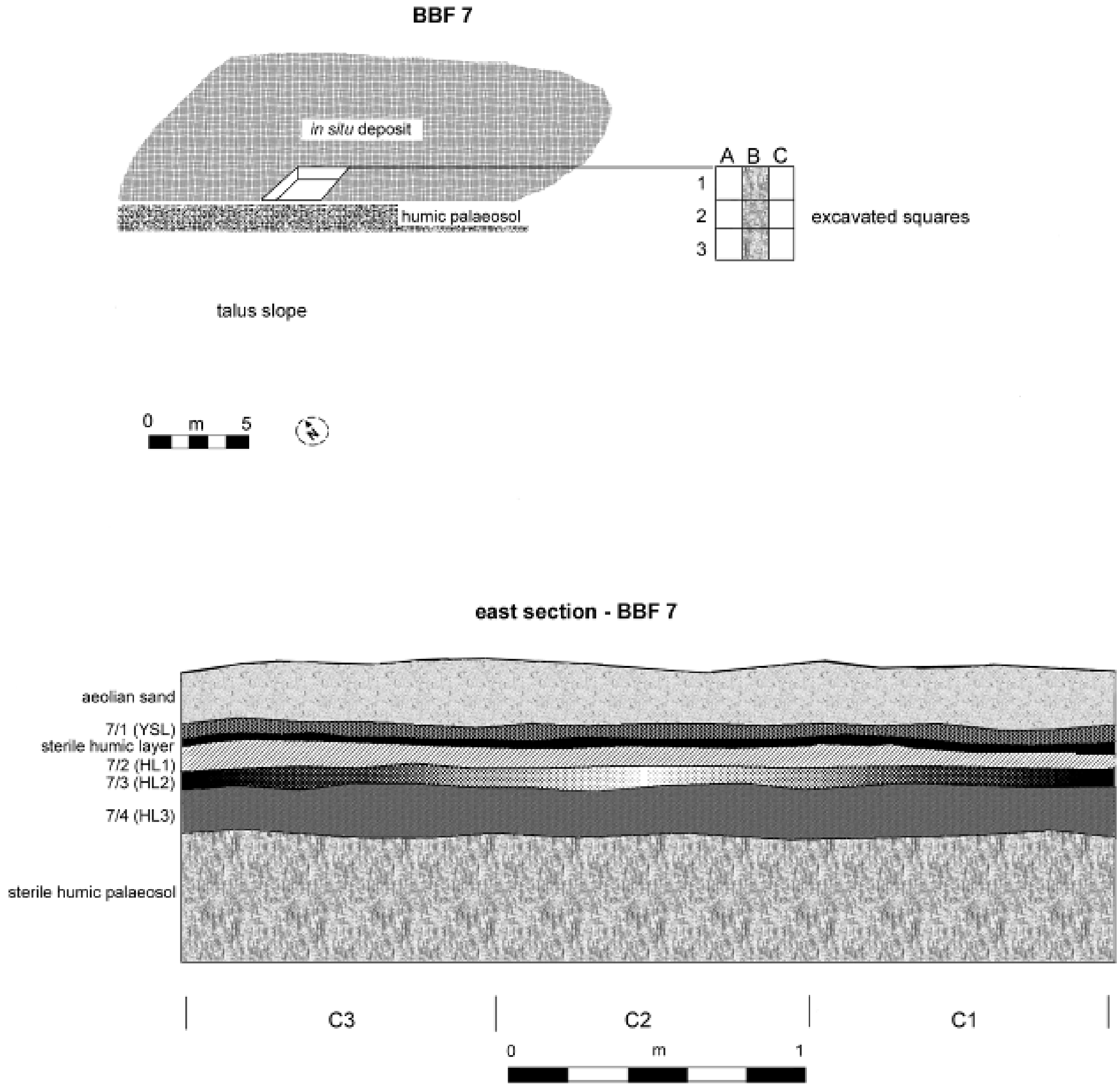


Fig. 5.17: BBF 7 site

Fig. 5.18. View of surface of BBF 6 site to south

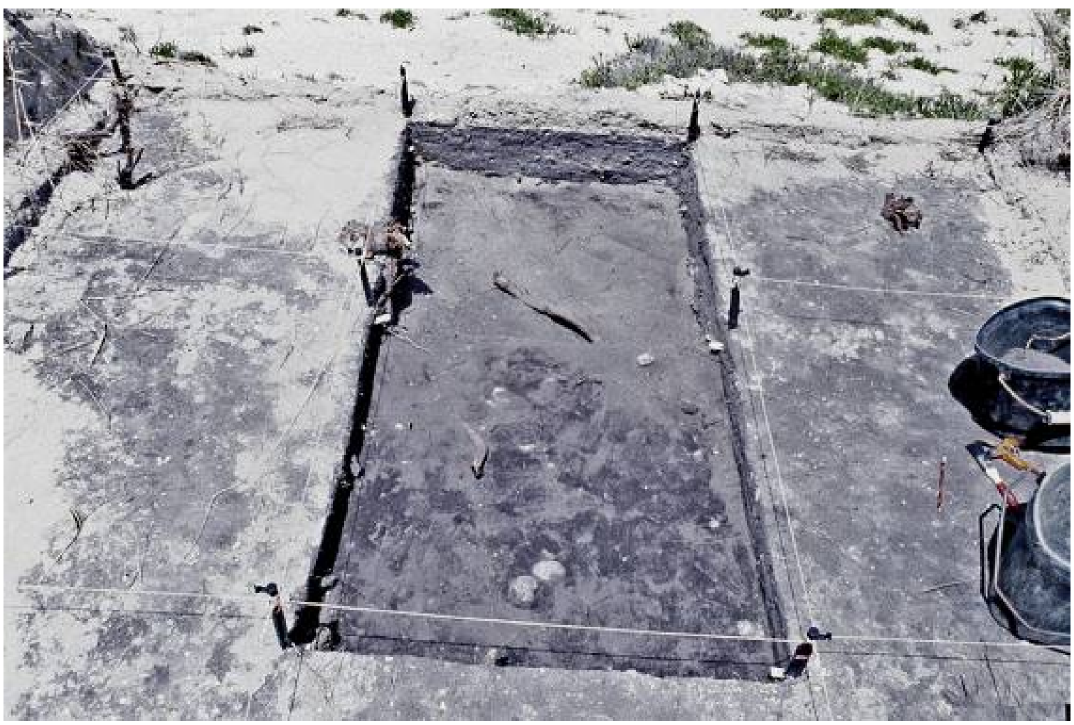


Fig. 5.19. BBF 6 site showing excavated squares B2 & B3. The dark humic layers are visible beneath the lighter overlying aeolian dune sand.

Layer 7/3 contained mainly fragmented shell although some whole *Turbo* and *Patella sp*. were evident, and a small amount of bone was recovered. The matrix was a heavily compacted black soil.

There was clearer evidence for a separation between layers 7/3 and 7/4. The density of shell deposits increases in 7/4, more whole *Turbo* and *Perna perna* are present, and the shell is mostly found in discrete pockets. More bone is present in 7/4, although it is generally very soft and wet and degenerated quickly when moved. Two bones from a large *Cymatoceps nasutus* fish were recovered. The surrounding matrix is still a compact, black soil. In the lower section of Layer 7/4 the deposit rapidly diminishes and is underlain by a sterile humic soil.

BBC (Blombos Cave) (34^{0}24'56.75 S 21^{0}13'24.94 E)

Background

Blombos Cave, situated near Still Bay in the southern Cape is some 100 m from the coast and 35 m above sea level (Fig. 5.20). The interior of the cave contains 55 sq. m of deposit with an estimated depth of c. 3 m at the front and c. 1.5 m toward the rear (Fig. 5.21. When excavations at BBC commenced in 1991 the cave entrance was almost totally sealed by dune sand; also c. 20 cm of undisturbed aeolian sand overlay the surface of the LSA indicating no disturbance of the cave's contents since the final LSA occupation c. 290 years ago. A test pit was dug at the rear of the cave in 1991 and excavations then commenced in the same location in 1992. There have been subsequent team excavations during 1997 – 2008 (Henshilwood *et al* 2001a; Henshilwood 2005, 2008).

The LSA deposits are less than 2 ka in age, not as deep as the MSA, and are more massively bedded and undistorted. In addition, burned layers tend to be thicker and several appear to preserve their original hearth-like structures. In the MSA levels the matrix is composed mainly of aeolian, marine-derived dune sand, blown in through the cave entrance and is intercalated with marine shell, decomposed humic materials and limestone, and wind-borne halites. Ground waters rich in CaCO3 percolate through the cave roof and walls creating an environment suited to the preservation of bone and shell, particularly near hearths and ash deposits. Carbonised partings represent occupation horizons and separate major units. The MSA deposits undulate considerably from the back to front of the cave due to subsidence that produces a 'wrapping effect' over the rock falls and occasional slump faults into gaps between rocks (Henshilwood *et al*, 2001a; Henshilwood 2005).

Sterile yellow dune sand 10 – 60 cm thick named BBC Hiatus blew into the unoccupied cave during lowered sea levels at c 70 ka. Shortly afterwards the cave entrance was blocked by a > 40 m dune (Jacobs *et al* 2006). It is likely that the cave only reopened during the mid-Holocene when high sea levels eroded the base of this dune 30 m below the cave causing the aeolian dune sand at the entrance to subside. BBC Hiatus separates the LSA and MSA across > 95% of the excavated area and provides visible evidence that the LSA occupation did not disturb the underlying MSA deposits (Henshilwood 2005).

Fig. 5.20. View of Blombos Cave looking to east. Entrance of cave is circled.

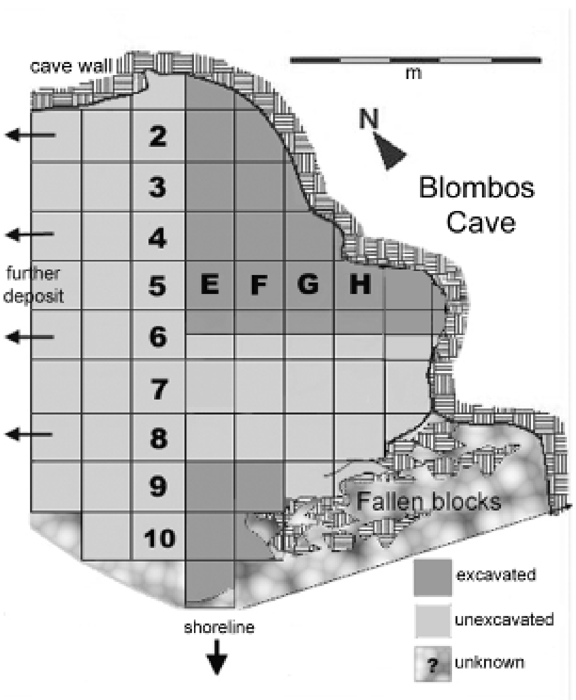


Fig. 5.21. Layout of Blombos Cave showing squares excavated from 1992 – 2008

Fig. 5.22. Cedric Poggenpoel excavating at BBC in 1998.

BBC: The Later Stone Age Levels

(Note: this site was originally given the acronym GSF 8 in Henshilwood 1995)

The roof height of the cave, prior to the initial excavation varied between 1 - 1,5 m. A ridge of aeolian dune sand which had accumulated at the cave entrance, virtually blocking access to the cave, was removed by excavating down to the level of the interior floor. All the sand removed was sieved for deposit but was found to be sterile. A baseline which coincided with the dripline at the cave entrance was established and the interior of the cave gridded in 1 sq. m units numbered from A1 to I9.

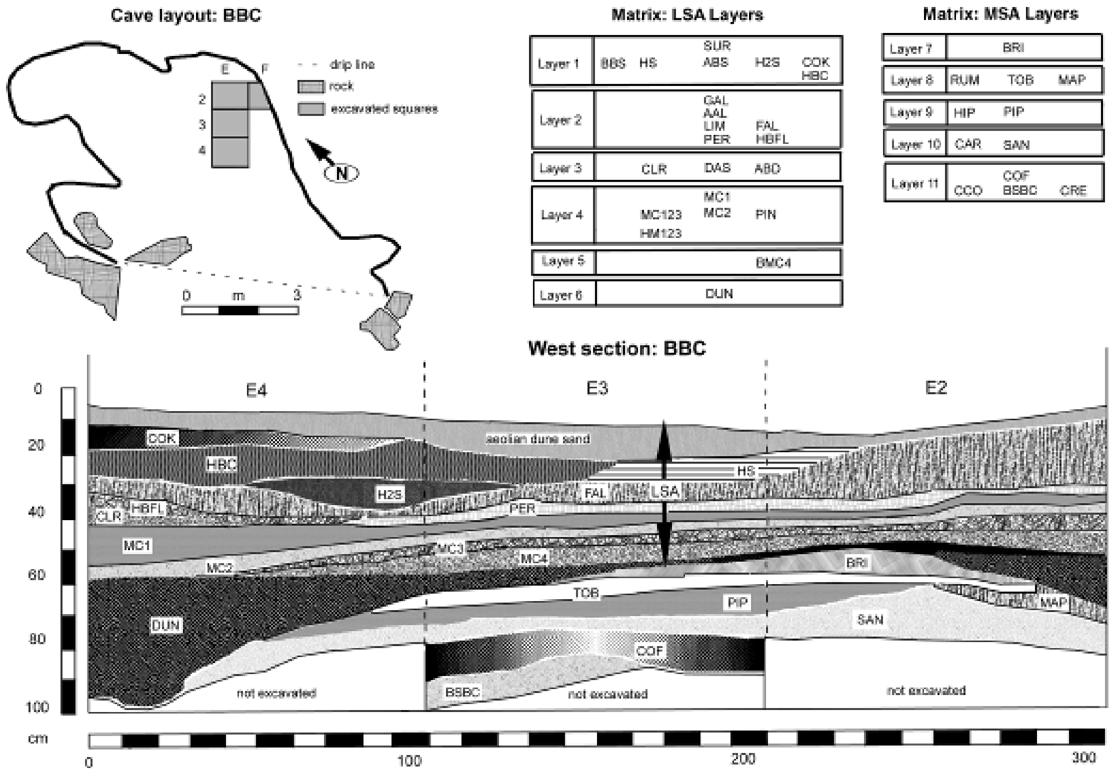


Fig. 5.23. BBC (Blombos Cave) site after excavations in 1992. Layers 1-6 fall within the LSA and Layers 7-11 within the MSA. The latter layers were subsequently subsumed with the M1 phase that contains Still Bay artefacts (Henshilwood 2001a, 2005)

In July 1991 a test pit of 1 sq. m. in Square E2 was stratigraphically excavated to a depth of 1 m by the author and Peter Nilssen. In November 1992, the author and Cedric Poggenpoel (Fig. 5.22) continued with the excavation in Square E2 to a depth of 1.5 m and a further three squares, F2, E3 and E4 were excavated. In total, 37 units were removed as discrete stratigraphic entities. Changes in soil colour and texture, localised features such as hearths and hearth stones, and the presence of discrete depositional units, for instance shell pockets, provided useful guides to ensure precise stratigraphic control during excavation. Due to the percolation of calcium-rich ground water and the presence of air-borne halites, bone and some organic materials are generally well preserved at BBC. The lower layers of the cave deposit, particularly Layers BBC L4 & BBC L5, are characterised by dense deposits of mammal and fish bone, and marine shell.

Based on an examination of the stratigraphy of unexcavated deposit, and after analysis of the various units in the laboratory, the 37 units removed were allocated to 11 individual layers (Fig. 5.8). Note that the acronym L, denoting LSA, is placed before the BBC layers that fall within the LSA, for example BBC L2. The MSA layers carry the acronym M and are numbered BBC M7 –

M11. These numbers bear no relation to the MSA phases denoted the M1, M2 and M3 phases in Henshilwood 2001a and in subsequent publications.

LSA Layers (Fig. 5.8)

Layer BBC L1

The surface layer consisted of a pale brown to dark brown aeolian sand containing a number of inclusions including small quantities of marine shell, fish and mammal bone and *Procavia capensis* coprolites. An ashy unit and hearth were removed. Charcoal samples taken from the hearth are radiocarbon dated at 290 ±20 B.P. The distribution and density of decomposed vegetation found in Layer BBC L1 suggests it was bedding.

Layer BBC L2

Speckled limestone inclusions in a tan to dark brown soil characterise the matrix in Layer BBC L2. A large hearth was excavated in Square E4. A medium density deposit was found in all squares consisting of marine shell, fish and mammal bone, some stone, mainly quartzite, and two pieces of pottery.

Layer BBC L3

Three units make up Layer BBC L3 and the deposits are similar in content and density to Layer BBC L2. Soil changes distinguish this layer from those above and below. The amount of limestone rapidly decreases in this layer, and in the northern end of the square Layer BBC L3 is underlain by sterile, aeolian sand which banks up from the back of the cave towards the front. A small ashy lens overlies the dune sand in Square F2.

Layer BBC L4

A range of soil colours is represented in Layer BBC L4, ranging from a white limestone patch to reddish brown and dark brown. However, the main factor which distinguishes this layer from the others is a very high density of well preserved marine shell, fish and mammal bone and stone, mainly quartzite. A number of large, contiguous hearths were excavated.

Layer BBC L5

Layer BBC L5 is similar in content to Layer BBC L4 but could be clearly separated from the above layer by changes in soil colour, in particular a loamy unit in Square E2 and the re-appearance of soft limestone inclusions. Layer 8/5 slopes steeply downwards towards the north in Square E2. Underlying Layer BBC L5 is a yellow, aeolian sand which slopes up steeply towards the south-west at the back of the cave.

Layer BBC L6

This layer consists of a combination of white and yellow aeolian sands, white clayey soil and isolated patches of dark soil containing deposit. Layer 8/6 is regarded as an hiatus layer composed of aeolian sand blown into the cave. Although a fair amount of deposit was recovered from Layer BBC L6, this almost certainly came from the lower levels of Layer BBC L5 and was worked into the soft sand by disturbance and trampling during the occupation of the upper layers. No hearths or other distinctive features are present in Layer BBC L6 and there are no clear stratigraphic separations within the layer.

The Middle Stone Age Still Bay levels: c. 77 – 70 ka

The Still Bay levels at the cave were first excavated in 1992 and then annually or biennially from 1997 - 2008. The results of the excavations from 1992 – 2005 are summarised below. Excavation of the >100 ka levels at the site is continuing. During excavations in 1992 we did not expect to find MSA deposits at the BBC site, or at least not at such a shallow depth (c. 60 – 80 cm from surface) (Fig. 5.24). Although the MSA was not an integral part of the research objectives of this project we decided at the time that we would test excavate a small section of these deposits (Henshilwood 1995, 2001a). Five MSA layers containing 12 stratigraphically distinct lenses were removed in a 20 cm deep section in 1992 (Henshilwood 1995, 2005) (Fig. 5.24). All layers contain a variety of Still Bay 'laurel-leaf' bifacial points, mainly in silcrete, but also in quartzite and quartz; end and side scrapers and blades are also present (Henshilwood *et al* 2001a; Villa *et al* submitted). At the time of excavation of these levels at BBC in 1992 ages for the Still Bay were not available, and there were limited options for dating beyond the c. 40 ka limits of C^{14} .

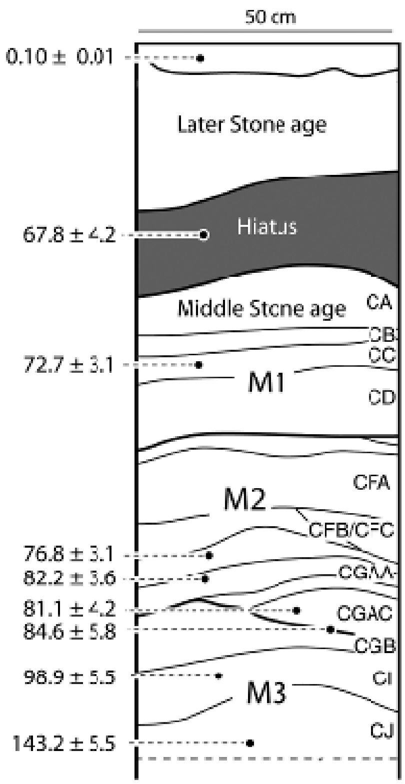


Fig. 5.24. Middle Stone Age levels at BBC indicating names of layers and ages.

The Still Bay was first suggested as a period or industry within the MSA to Goodwin (e.g. 1935) by C.H.T.D. Heese in the 1920s. The 'lance-head' in elongated laurel-leaf-form typified the Still Bay-type artefact according to Heese (n.d.). He did not subscribe to Goodwin's view that the oak-leaf shaped 'spear point' or 'point' should be included in the definition (Goodwin & van Riet Lowe, 1929:119). However, the Still Bay Industry, as proposed by Goodwin, extended to include numerous lithic forms attributed to the newly named 'Middle Stone Age' (Goodwin 1928, 1929, 1935). Strangely, considering his previous opposition to Goodwin's schema Heese (n.d) later wrote "the Still Bay here covers Glen Grey, Pietersburg and Howiesons Poort. There is no necessity for treating them as separate entities" (Heese 1933:44). The imprecise definition of the Still Bay was a major factor that led to confusion in subsequent Middle Stone Age excavations, a prime example being the Peers Cave site located in the Fish Hoek Valley, Cape Province (see Jolly 1948; Anthony 1963, 1967) although at the time of excavation Peers (1929:9) did state that the "true Still Bay with …typical laurel-leaf spear heads…lay beneath the Howiesons Poort". The chronological position of the Still Bay relative to the Howiesons Poort remained unclear and by the 1950s lanceolate bifacial points were largely regarded as an integral component of the Howiesons Poort (e.g. Goodwin 1958; Malan 1955). After the 1960's the term Still Bay gradually fell out of use and its validity was questioned by Sampson (1974) although Schirmer (1975) still uses the term in her monograph on Dale Rose Parlour. Imprecision in use of the term Still Bay was exacerbated by its application in Kenya (Anthony 1972) and as far north as Ethiopia (Wendorf & Schild 1974).

There were hints at the relationship between the Still Bay and Howiesons Poort though, particularly at Klasies River where bifacially retouched flakes came from levels below the Howiesons Poort (Singer & Wymer 1982; Wurz, 2000), and similar finds were made at Nelson Bay Cave (Volman 1981) and Paardeberg (Wurz 2000) . New schemes for the Middle Stone Age were suggested (e.g. Volman 1984; Singer & Wymer 1982) and although the term Howiesons Poort was maintained the Still Bay was not.

Excavations at BBC in the 1990s (Henshilwood 1995; 2008) and at Hollow Rock Shelter (Evans 1994), also in the Cape Province revived the term. At both sites Still Bay lanceolate bifacial points were found in situ (Figure 3). At BBC good organic preservation meant the Still Bay artefacts lay in the remains of food debris, including bone and marine shell (Henshilwood *et al*. 2001a). The BBC excavations led to a revival of the proposal to include the Still Bay as a sub-division of the Middle Stone Age

Still Bay bifacial points are a distinct type restricted to the Cape. We propose "Still Bay sub-stage" as a regional, culture-stratigraphic term for assemblages with fully bifacially flaked, lanceolate shaped points". Henshilwood *et al*. 2001a: 429, 2008).

Recent excavations at Diepkloof rock-shelter (Parkington *et al* 2005; Rigaud *et al*., 2006) in the Western Cape and at Sibudu (Wadley 2007) in Kwazulu-Natal have uncovered a Still Bay facies with bifacial points below the Howiesons Poort levels.

BBC is at present the only site where the Still Bay has been dated using a number of methods and the results published (Jones 2001; Jacobs *et al*. 2003a,b, 2006; Tribolo 2003; Tribolo *et al*. 2005, 2006). The Middle Stone Age levels at BBC are divided into three phases, M1, M2 and M3 (Fig. 5.24). The two upper phases M1 and M2 contain bifacial foliate points (Fig. 5.25) and are both assigned to the Still Bay. Sterile sand 10 - 50 cm thick covers the M1 phase across the cave and is named the Hiatus level. Optically stimulated dating of this hiatus by the multiple grain technique yielded a depositional age of 69 ± 5 ka and 70 ± 5 ka (Henshilwood *et al*. 2002: Jacobs *et al*. 2003a, b; Jacobs *et al*. 2006), and provides a minimum age for the Still Bay levels below.

Fig. 5.25. Bifacial points from the MSA M1 & M2 phases at BBC

Thermoluminescence dates were obtained for five burnt lithic samples from the M1 phase and the results indicate that the time interval between 74 ± 5 and 78 ± 6 ka is the most reliable age for the M1 phase deposits (Tribolo *et al*. 2006). An optically stimulated luminescence age of 72.7 ± 3.1 ka was obtained for the M1 phase (Jacobs *et al*. 2003 a,b). Four dates using the same method for the M2 phase fall within the range 84.6 ± 5.8 ka to 76.8 ± 3.1 ka (Jacobs *et al*. 2006) (Fig. 5.24) . These results are in good agreement with electron spin resonance dates on teeth (Jones 2001). The inference that can be drawn from these results is that the Still Bay levels at BBC date to between c. 72 – 77 ka (Fig. 5.24). Provisional dates for the Still Bay at Hollow Rock Shelter obtained by optically stimulated luminescence fit within this timeframe (Minichillo 2005:99).

At most sites there is a preference for fine grained raw materials to make the Still Bay bifacial points (Evans, 1994; Henshilwood *et al*, 2001a; Minichillo, 2005). It was generally believed that Still Bay bifacial points are restricted to the coastal belt of the Western Cape Province (e.g. Minichillo, 2005:132) but this is no longer the case as the bifacial points reported from Sibudu in Kwa-Zulu Natal (Wadley 2007) fall within this category. These artefacts identify that a Still Bay phase is present at a site and indicate a probable date for these deposits, based on present knowledge, of between c. 77– 72 ka.

Bifacial roughouts correspond to various stages of the reduction process and flakes produced by thinning and shaping the bifacials are regularly recovered at Still Bay sites (Evans, 1994; Henshilwood *et al*., 2001a; Minichillo, 2005). Bifacial points likely served as multi-functional tools and were used as spear points and knives (Minichillo, 2005). This is confirmed by macrofracture analysis of the Blombos Cave bifacials that shows they were used as both tips for hunting spears and also as cutting tools (Lombard 2007). Still Bay bifacials may have also served in a symbolic role (Henshilwood *et al*., 2001a; Villa *et al* submitted) and in this regard it is interesting to note that Burkitt (1928) interpreted the Still Bay as marking the arrival of 'modern people' on the subcontinent. Still Bay bifacials represent a high level of technical skill in the Middle Stone Age and the method of manufacture was undoubtedly in keeping with people deemed 'modern' in their behaviour (Henshilwood & Marean 2003, 2006; Minichillo 2005:133). The predominant use of non-local raw materials, recorded for example at Blombos, may relate to adding exchange value to those tools (cf. Wiessner 1983) and promoting social relations (Mellars 1996), rather than having a functional significance.

Ochre, a mineral rich in iron oxide, is present after ca. 100 ka at most Middle Stone Age sites (Watts 1999, 2002; Barham 2001; Wurz 2000; Wadley 2001). It is found at a number of Still Bay sites, for example at Hollow Rock Shelter (Evans 1994), Dale Rose Parlour (Schirmer 1975) and Diepkloof (Parkington *et al* 2005; Rigaud *et al*. 2006). Evidence of scraping or grinding is observed on many pieces, probably to produce powder and some pieces have crayon or pencil shapes as a result of direct application of the ochre to an abrasive surface (Singer & Wymer 1982:117; Clark & Williamson 1984, Rigaud *et al*. 2006). The presence of ochre at these archaeological sites is interpreted by some researchers as early evidence of the symbolic use of colourants (Watts 1999; Henshilwood *et al*. 2001a, 2002) while others have more practical explanations (Klein 1999) with some suggesting it was used for skin protection, as medicine (Velo 1984) or to enhance hafting (Wadley 2005). Various views may be correct as it seems probable that ochre can be used in several ways.

At Blombos Cave more than 2000 pieces of ochre, many bearing signs of utilisation have been recovered from the Still Bay (M1 & M2 phases) (Henshilwood *et al*. 2002) (Figure 3). Two deliberately engraved pieces come from the M1, AA-8937 and AA-8938 (Henshilwood *et al*. 2002) and further engraved pieces from M1 and M2 have been identified (Henshilwood *et al*. submitted). Two ground facets are present on specimen AA 8937 and on the larger of these a cross-hatched design is engraved. Specimen AA 8938 has one ground facet and on this a complex cross-hatched pattern was engraved (Fig. 5.25) . On both pieces it is clear that the designs result from deliberate intent and arguably are among the most complex and clearly-formed of objects claimed to be early abstract representations (d'Errico *et al*. 2003; Lewis-Williams & Pearce 2004; Mithen 2005; Mellars 2005, 2006). These pieces would certainly not be out of place if placed amongst symbolic representations in the Upper Palaeolithic (Mellars 2005). It is reasonable to contend that the ochre assemblage from the Still Bay levels at Blombos Cave, and arguably at other Still Bay sites, provides evidence for social and stylistic elaboration during this period.

Fig. 5.26. Engraved ochre SAM – 8938 from the M1 phase at BBC. The age of this phase is c. 72 ka.

Still Bay assemblages were in the past regarded as one-dimensional in that only stone artefacts were preserved (Schirmer 1975; Evans 1994). The Peers Cave site was a rare exception as some organic material is reported but not well described (Peers & Goodwin 1953). Organic materials, associated with the Still Bay bifacials, are generally well preserved at BBC and provide new insights into this period of the Middle Stone Age. Shellfish and fish are regularly consumed during the Still Bay occupation and a range of terrestrial and marine animals were hunted, trapped and collected. The overall subsistence pattern at BBC signifies that no clear distinction can be made between Later Stone Age and Middle Stone Age subsistence behaviour at the site (Henshilwood *et al* 2001a; Henshilwood 2004, 2007,2008).The implication is that during the Still Bay occupations the subsistence mode was essentially modern.

Bone tools are an unexpected technological innovation in the Still Bay at Blombos Cave. Regarded as a distinctive marker in the Eurasian transition to modern cognitive behaviour (e.g. Clark 1989; Thackeray, A.I. 1992; Klein 1995) they are rare at Middle Stone Age sites (McBrearty & Brooks 2000). More than thirty formal bone artefacts have been recovered from the Still Bay levels at Blombos Cave, including awls and 'points' (Henshilwood & Sealy 1997; Henshilwood *et al*. 2001a,b; d'Errico & Henshilwood 2007). There is clear evidence that these tools were in situ when recovered (Henshilwood 2005). The majority are awls made on long-bone shaft fragments (Fig. 5.27 b), further manufactured by scraping and then used to pierce soft material such as leather (Henshilwood *et al* 2001b or pierce shells to make beads (d'Errico *et al*. 2005). At least some bone tools that were carefully polished after being shaped by scraping are probably projectile points made for hafting (Fig. 5.27 a). It is noteworthy that points are treated differently to awls. The high polish on these points has no apparent functional reason that can de detected but seems rather a technique that gives a distinctive appearance - an "added value" - to these artefacts. These too may have formed part of a material culture exchange system amongst groups to maintain or even enhance social relations. The Blombos bone tools provides comprehensive evidence for systematic bone tool manufacture and use but we cannot be certain if this was also the case at other Still Bay sites. Bone tools are also reported from the c. 60 – 65 ka Howiesons Poort levels at Sibudu Cave (Backwell *et al* in press) and from Klasies River (d'Errico & Henshilwood 2007). A note of caution is that we are not certain that the production of worked bone gives a modern character to all Middle Stone Age material culture since little is known about the evolutionary significance of bone shaping (Henshilwood & Marean 2003, 2006; Backwell & d'Errico 2005). Symbolic marking on bone is a likely feature that supports a symbolic interpretation (Henshilwood *et al* 2001b). Microscopic analysis of a bone fragment marked with eight parallel lines from the Still Bay levels indicates they are the result of deliberate engraving and were possibly made with symbolic intent (d'Errico *et al*. 2001).

Fig. 5.27. Bone tools from the M1 & M2 phases (c. 77 – 72 ka) at BBC: a) points b) awls. (Image courtesy of Francesco d'Errico).

A strong argument for early behavioural modernity in the Upper Palaeolithic is the presence of personal ornaments (Klein 1995, 1999; Wadley 2001; Mellars 1996, 2005; d'Errico *et al*. 2005). The discovery of more than 70 shell beads in the Still Bay techno-tradition at Blombos Cave has added a new dimension to the modern human behaviour debates (Fig. 5.27). An analysis of 41 of these shell beads has been published (Henshilwood *et al*. 2004; d'Errico *et al*. 2005) and a report on the additional beads is pending. All the recovered Nassarius kraussianus 'tick' shells (Fig. 5.27) were carefully pierced using a bone tool to create a keyhole perforation (d'Errico *et al*. 2005). These perforations are anthropogenic and deliberate. These beads were then strung, perhaps on cord or sinew and worn as personal ornaments. Repeated rubbing of the beads against one another and against the cord resulted in discrete use wear facets on each bead that are not observed on these shells in their natural environment. Microscopic analysis shows distinct facets which flatten the outer lip or create a concave surface on the lip close to the anterior canal. A similar concave facet is often seen opposite to the first one, on the parietal wall of the aperture. These use-wear patterns, and the keyhole perforations, are the principal factors that defines the shells as beads. Microscopic residues of ochre occur inside some of the beads and result from deliberate colouring or by transfer when worn (Henshilwood *et al*. 2004; d'Errico *et al*. 2005).

The wearing and display of personal ornaments during the Still Bay phase was not idiosyncratic. Discrete groups of beads with wear patterns and colouring specific to that group were recovered from various levels and squares within the site. This patterning suggests that at least a number of individuals may have worn beads, perhaps on their person or attached to clothing or other artefacts. The shell beads also provide insights into technological aspects of the Still Bay including the ability to drill, the use of cord or gut for threading and the probable tying of knots to secure the beads. A comprehension of self-awareness or self recognition is implied by the wearing of the beads or other personal ornaments and was likely an important factor in cognitive evolution that was selected long before the introduction of beads (Vanhaeren 2006). Further, syntactical language would have been essential for the sharing and transmission of the symbolic meaning of personal ornaments within and between groups and also over generations, as is also suggested for the engraved ochre pieces (Henshilwood *et al*. 2004; d'Errico *et al*. 2005; Mellars 2005).

Fig. 5.28. *Nassarius kraussianus* shell beads from the M1 phase at BBC (c. 72 ka). (Image courtesy of Francesco d'Errico).

BBC: E*nvironmental change and symbolic signalling in the Still Bay levels (after Henshilwood in press)*

Rapid expansion of social learning and the use of symbolic culture to mediate human behaviour may be related to adaptations to highly variable environments (Richerson & Boyd 1998; Alvard 2003:83). Technological complexity and curation of material culture is likely to increase in cold climates or during periods of social and/or environmental stress (Henshilwood & Marean 2003, 2006). If models linking cultural complexity with ecological variability are correct would this fit the environmental conditions in the Western Cape during the Still Bay and Howiesons Poort techno-traditions (Henshilwood in press) ?

During the initial phases of the Still Bay during MIS 5a at c. 77 ka years ago conditions in the Western Cape Province, particularly in the southern Cape, were mild with moisture levels higher than during the Late Holocene (Henshilwood *et al* 2001a). On both the west and southern Cape coasts the ocean and coastal plains offered a rich source of readily accessible nutrients. (Henshilwood & Sealy 1997; Henshilwood *et al* 2001a). In particular, seafood would have provided nutrients, now known to be important in infant brain development, in particular the omega-3 fatty acid, docosahexaenoic acid (Broadhurst *et al* 2002). Ecological conditions during mid MIS 5a were certainly conducive to population growth in the Western Cape. This was not the case in the tropical and sub tropical zones in east and central Africa where drought conditions persisted from c. 135 – 70 ka years ago (Scholz *et al* 2007). Expansions of humans from these regions in southerly and perhaps northerly directions are not unlikely (Marean & Assefa 2005; Mellars 2006; Wadley 2007).

Although there is no direct evidence at this stage it is conceivable that the Still Bay techno-tradition of bifacial points emanated from further north as they bear at least some physical relationship to the lanceolates of the final Lupembo-Tshitolian tradition from Twin Rivers in Zambia provisionally dated at c. 95 ka years ago or later (Clark & Brown 2001) and to some of the thin elegant lanceolates found in the Lupemban dated at c. 300 ka years ago (McBrearty 1988). The distinct similarity in physical appearance between these Zambian lanceolates and those of the Aterian Industrial complex found in North Africa that date to c. 80 -70 ka years ago is noted by Clark and Brown (2001:325). Whether a Pan-African cognitive system was then operational is speculative, but a drift of ideas from south to north and vice-versa that may have coincided with the movement of people is possible. Local variants in the Western Cape of the Still Bay and Howiesons Poort may have developed in situ and could represent two examples of localised evolution.

At the latter stages of MIS 5a and into MIS 4 environmental conditions in the Western Cape deteriorate and lowered sea levels, sea surface temperatures and precipitation are reported (Vimeux *et al* 1999). The densities of shellfish collected at Blombos, for example, decrease as sea levels fall in the latter stages of the Still Bay. Changes in the vegetation of the Western Cape suggest drier and cooler conditions prevailed with increased aeolian deposition on the coastlines in the southern and western Cape. By 70 ka years ago the entrance to Blombos Cave is blocked by aeolian sand (Jacobs *et al* 2003 a,b) and the Still Bay occupations cease at this site.

In the latter stages of the Still Bay occupations in the Western Cape maintaining good social relations amongst regional groups may have been vital. Environmental degradation would have placed greater stress on subsistence strategies and increased demographic pressure on coastal areas may have resulted from groups being forced to move out of the arid interior regions of the Western Cape. One way of ensuring good social relations between groups, or even within groups, is through the exchange of high value items. Exactly how or which items of recovered Still Bay material culture played a symbolic role, or whether a form of *hxaro* (exchange) even took place is largely speculative. Blombos Cave, Hollow Rock Shelter, Peers Cave and Dale Rose Parlour seem to represent 'craft specialisation' locations during the Still Bay phase. At these sites there appears to be an emphasis on regionalism though the production of distinctive foliate bifacial points, often in very large quantities. It is tempting to speculate that these artefacts, and perhaps others, served a practical and symbolic role (Henshilwood *et al* 2001a; Henshilwood & Marean 2003, 2006; Mellars 2006).

The Still Bay levels at Blombos Cave provide a useful case study for assessing, at least at this site, whether intensification in the production of material culture with possible symbolic connotations may be related to environmental change. Of the artefacts recovered from the Still Bay levels at Blombos perhaps the beads and the engraved ochres are the best candidates for the 'symbolic' artefact category, but bifacial points, ochre and some bone tools may also have served in this role. Most are present in small numbers in the M2 phase corresponding with the start of the Still Bay. A rapid increase in the numbers of these artefacts in the early levels of the M1 phase corresponds fairly well with deteriorating climatic conditions at about c 72 ka years ago. Almost 60% of the bifacial points (n= 168) and beads (n = 65) were found in this phase. The highest numbers of bone tools (n = 28) and at least two engraved ochre pieces also date to this period. The highest quantity of ochre is also reported in the M1 phase (74%). In the terminal phases of the Still Bay occupation at BBC, just below the c. 70 ka hiatus level, the numbers of these artefacts decreases, especially the bone tools and bifacial points. The exact significance of these decreases is unclear, but it may signal a lesser importance placed on symbolic material culture. Additionally, the decrease in numbers of bifacial points and bone tools may indicate a change in the tools used for hunting and processing that was precipitated by environmental change. In either event the intensity of manufacture of tools and objects with possible symbolic value decreases just prior to the final phases of the Still Bay occupation. Subsequently the cave is abandoned and shortly thereafter the entrance is closed by aeolian sand (Jacobs *et al* 2006).

A post Still Bay hiatus, although hypothetical at this stage, may link to a period of human expansion, perhaps climate driven, out of the Cape via the east coast and northwards along a coastline exposed by lower sea levels (Henshilwood in press). Ameliorating climatic conditions reported for East Africa after c. 70 ka years ago (Scholz *et al* 2007) may have encouraged this process. The expansion of the L2 and L3 mt DNA lineages at this time and the correspondence of a demographic and geographical expansion out of Africa at about 60 – 80 ka years ago also fits this model (Stringer 2000; Rose 2004; Forster 2004; Mellars 2005; Hudjashov *et al* 2007).

The innovative technologies and social practices recorded at archaeological sites during the period 77 – 70 ka years ago in the Western Cape are only one part of a behavioural montage that also spread across other regions in Africa at this time. Rapid advances in human cognition after c. 200 ka years ago, partly driven by climatic variability, manifest in material culture practices not previously observed in the Middle Stone Age (Henshilwood in press). After c. 100 ka years ago symbolically mediated behaviour seems strongly allied to material culture. The innovations that are manifest during the Still Bay and Howiesons Poort periods may have been driven by group or individual endeavour to adapt or adopt technology to cope with variable environments, so called variability selection (Alvard 2003:142). These same artefacts, it seems, functioned symbolically as mechanisms for social cohesion although the adaptive advantage of the acquired capacity for complex human culture probably only became apparent when complex traditions began to evolve (Henshilwood in press).

Human culture can be minimally defined as socially transferred information that has material form stored as information in our brains (Pearce 2002). Once the capacity for complex human culture was in place, whether it was ecologically driven or not, the process that followed is unlikely to have been random. Cultural novelty is never random, but is generated and assimilated both strategically and contextually (Gabora 2001: 219). Innovation is a reflection of the accumulated knowledge of individuals, the circumstances they found themselves in, and the social structure in which they are embedded. Innovations will thus have a much better than chance probability of being fitter than their predecessors (see Shennan 2002; Boyd and Richerson 1985). The incremental, marginal modifications built up over many generations contributed to the complexities of subsistence systems, material culture and languages during the Still Bay and were almost certainly carried to later periods. We are able to work now only with a fraction of the knowledge that was driving these processes then, but amongst this complexity it seems that climatic determinants, as is the case today, was a major driver in promoting innovation and variability in material culture in the past (Henshilwood in press).

BBF 9 (34^{0}24’52.91 S 21^{0}13’12.13 E)

Site Description (Figs. 5.29, 5.30, 5.31)

Elevated at 25 m a.s.l., BBF 9 is a small shelter located in a calcarenite cliff to the south of BBF and is 40 m from the sea. The deposit extends over little more than the 8 sq. m that was excavated. Initially, the only visible evidence of occupation was a light scattering of quartz chunks and some shell on the surface of the shelter. A plan of the shelter was drawn and a 4 m x 2 m grid laid out for excavation. A large slab of calcarenite roof spall covered Squares A1 and B1 and had to be removed using a hammer and chisel before excavation commenced.

During excavation six discrete units were identified at BBF 9. All these units were contiguous and although they could be stratigraphically isolated during excavation there was no indication that they were temporally separated. Aeolian dune sands originating from the dunefields above the cliff face are continually being deposited on the surface of the shelter and during the excavation it was necessary to remove a layer of windblown sand each morning which had been deposited overnight. No evidence was found of the deposition of similar wind blown sand between the various layers at BBF 9, leading to the conclusion that the excavated assemblage was formed during a single, continuous period of occupation.

The most dominant feature at BBF 9 is a large hearth, 10 - 15 cm deep, which extends over 6 sq. m. Dense deposits of shellfish, in particular *Diloma* and *Turbo,* were found in and around the hearth. Mammal species recovered include dolphins, seals and a range of bovids. The presence of two *Coronula diadema* barnacles, found only on cetaceans, suggests that whale meat was brought to the site. Quartz chips, chunks and flakes are ubiquitous, but formal tools are rare. A small number of pottery sherds are present.

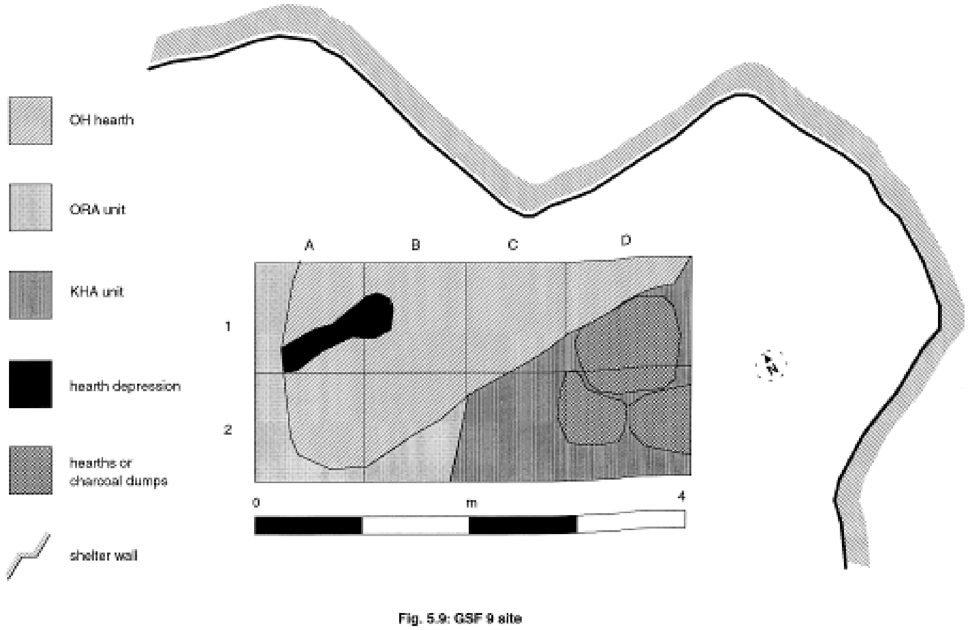


Fig. 5.29: Layout of BBF 9 site with excavated area

Fig. 5.30. BBF 9 shelter site – south aspect

Fig. 5.31. BBF 9 site showing unit 'Hearth in KHA' facing to east.

Stratigraphy

Unit OH

OH was a large hearth containing dense deposits of ash and charcoal, which extended in an east-west direction across most of the site. The hearth dipped down to the west and was 12 cm deep in Squares A1 and B1. OH extended only thinly into Square D1. A dense concentration of *Diloma sp.* shells were mixed with the charcoal in the hearth. In Square B1, a 10 cm deep depression in the hearth contained three distinct circular impressions. A channel emanating from these impressions cut through the body of the hearth to the western edge of Square A1. These impressions appear to have been made by pots placed in the fire which were later dragged to the edge of the hearth causing the channel found in Square A1. In the northern section of Squares A1 and B1, where the OH unit is 10 - 12 cm thick, the hearth extends beyond the site boundary and terminates just short of the northern wall of the shelter.

Unit KHA

The surface unit, KHA, extended over most of the site and dipped downwards from south to north increasing in thickness from 5 cm to 14 cm. It is not found in Squares A1 and B1. Within the dune sand matrix small amounts of bone, marine shell and quartz were present. The KHA unit appears to be a surface scatter emanating from a migration of some objects from dense lower units into later aeolian sand deposits. Three small hearths containing a dense concentration of charcoal were found in the south-eastern section of the site in Squares D1, D2 and C2. These hearths were contiguous with the main hearth OH and may have been either an extension of OH or may represent charcoal dumps raked from the main hearth.

Unit ORA

A dense deposit of shell, mainly *Turbo sarmaticus*, characterises the ORA unit which lies on the southern and western side of the large hearth OH and is confined mainly to the Squares A2 and B2. It is possible that after *Turbo* were cooked on the fire, possibly in earthernware pots, the meat was removed and the shells dumped in the area surrounding the hearth. The ORA unit is typical of a shell dump.

5.5: Site classification and taphonomy

The main objective of classifying the excavated sites/units at BBF to type was to enhance the clarity of inter-site comparisons, both spatially and temporally. During the early stages of analysis of the recovered shellfish it was observed that a certain amount of 'noise' was apparent if comparisons were only made on an inter-site/unit basis. As it was felt that this 'noise' may mask any, or some, of the patterning present, it was decided to classify the sites to type. In the event the 28 excavated sites/units at BBF were classified into 3 types based on age, location and artefactual content. Type 1 sites include BBF 1, 2, 3, 4, 5 and BBF 7 (all units); Type 2 sites are BBC (all units) and BBF 9; Type 3 is represented by the BBF 6 site (all units).

Type 1 sites predate 2000 B.P. and are located in the dune area of the coastal foreland. BBF 1-5 are single occupation sites, BBF 7 is a multiple-occupation site with four stratigraphic units BBF 7\1, 7\2, 7\3 and 7\4. Type 2 sites postdate 2000 B.P. and are situated in shelters in the near coastal cliffs. BBC is a multiple-occupation cave site with six stratigraphic layers, namely BBC layers L1 - L6. BBF 9 is regarded as a single occupation site. BBF 6 is classified as a Type 3 site and is sub-divided into 12 stratigraphic units, BBF 6\1 - 6\12. It is situated immediately adjacent to the sea and is regarded primarily as an 'extraction' or processing site (*cf.* Mellars 1987; Henshilwood *et al* 1994). The oldest unit is dated at 4170 B.P. and the youngest at 3630 B.P. Type 1 and Type 2 sites all contain artefactual material, including stone tools, a range of marine and terrestrial faunal; some have evidence of hearths. All the Type 1 and Type 2 sites, with the possible exception of BBF 5 *(cf.* Chapter 6) are regarded as occupation sites.

Further refinement in the classification of sites was also considered by examining three additional variables, namely. taphonomy, site size and whether a site was single or multiple occupation. Site size was rejected as a controllable variable on a number of grounds: firstly, the original size of open sites was difficult to determine as the original *in situ* portion had frequently been eroded by wind and water action resulting in much of the sites contents being deposited on the talus slope (e.g. BBF 2, 4, 5); secondly, some of the open sites were partially covered by a thick layer of overlying dune sand (e.g. BBF 1 & 7) and the full extent of the site could not be determined; thirdly, in the cases of BBF 6 & BBC only a portion of each stratigraphic unit was excavated and the full spatial extent of a unit could therefore not be determined.

Establishing a measure for comparing the preservation of inter-site assemblages was regarded as potentially promising for examining inter-site variability. The reasons for good or poor taphonomy could of course be linked to a number of factors including the length of time the site was exposed to the elements, how soon a site was covered by sand after occupation, the alkalininity or acidity of the matrix, the kinds of faunal or other materials originally deposited, the susceptibility of a shellfish species to breakage and/ or damage associated with burning, the method of meat extraction from a species of shellfish, the age of the site, the degree of trampling at the time of occupation or during later re-occupation and post-depositional damage by animals, roots etc. Attempting to unravel the multi-factorial causes of good or poor preservation for each site was considered beyond the scope of this project.

However, one promising method for comparing inter-site taphonomy was by examining the fragmentation of marine shells. Shells occur in abundance at all sites and during excavation a method was established to measure the degree of shell fragmentation for each site. All the shells recovered from each site were retained after sieving, with the exception of shell fragments smaller than 1.5 mm. Shells which were whole or part-whole and identifiable to species were separated from the fragmented shell bulk. Whole or part-whole shells were weighed separately from comminuted shell (Table 5:1).

A ratio of the mass of whole/part-whole shell (g) to comminuted shell was calculated for each of the 28 site/units and plotted on a histogram in classes falling between <1 and >15 (Fig. 5.10). Low ratios indicate poor shell preservation and vice versa. Two distinct classes are observed: 22 of the site/units fall below values of 6; 6 sites/units have a value >10.

Sites with a ratio of <1 include BBF 7\1 , 7\2 & 7\3 (Type 1) and BBC layers L1, L2 & L6 (Type 2). Sites in the 1 - 3 class include BBF 1, 4, 7\4, BBC layers L1, L2, L3, L4 & L6. These results suggest that multi-occupation living sites have the highest shell fragmentation rate, irrespective of location. There are some explanations for the two exceptions in this category, namely BBF 1 & 4 which are considered single occupation sites: the whole BBF 1 assemblage was enclosed in a dense breccia, and shell fragmentation is largely attributed to damage occurring to shells during the extraction process in the laboratory; a forestry road is known to have cut across the BBF 4 site in the past causing excessive shell fragmentation on its western edge.

Site Type	BBF Site No.	Whole Shell (WS) (g)	Comminuted Shell (CS) (g)	Ratio WS:CS
1	BBF 1	12219	7298	1.67
1	BBF 2	52494	12247	4.29
1	BBF 3	78962	14891	5.30
1	BBF 4	59951	30316	1.98
1	BBF 5	17116	3762	4.55
1	BBF 7\1	8342	12117	0.69
1	BBF 7\2	2961	4717	0.63
1	BBF 7\3	4338	6412	0.68
1	BBF 7\4	13306	6838	1.95
2	BBC L1	1833	2694	0.68
2	BBC L2	5946	12328	0.48
2	BBC L3	901	330	2.73
2	BBC L4	33269	11993	2.77
2	BBC L5	9104	2209	4.12
2	BBC L6	2073	5090	0.41
2	BBF 9	68294	17724	3.85
3	BBF 6\1	3495	365	9.58
3	BBF 6\2	6129	1802	3.40
3	BBF 6\3	3251	313	10.39
3	BBF 6\4	5610	395	14.20
3	BBF 6\5	2277	152	14.98
3	BBF 6\6	2280	181	12.60
3	BBF 6\7	2341	524	4.47
3	BBF 6\8	2059	517	3.98
3	BBF 6\9	744	194	3.84
3	BBF 6\10	385	18	21.39
3	BBF 6\11	2003	307	6.52
3	BBF 6\12	1295	401	3.23

Table 5.1: Ratio of whole or part whole shell (g) to comminuted shell (g).

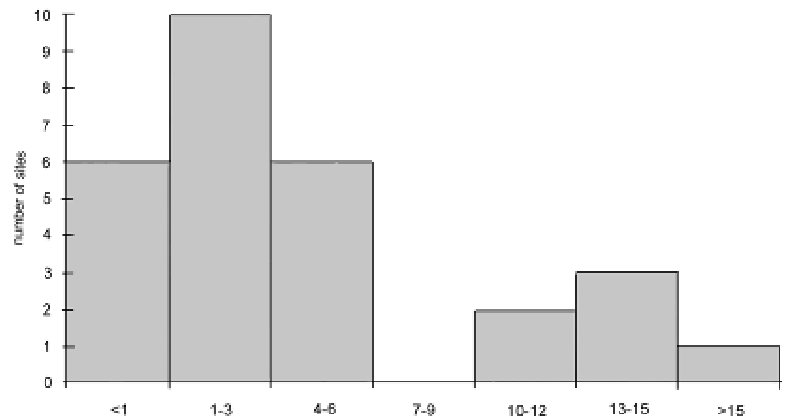


Fig. 5.32: Ratio: Whole shell (g): comminuted shell

In Type 1 & Type 2 sites shell is best preserved at BBF 2, 3, 5 & 9 - all single occupation living sites. The single Type 3 site, BBF 6 clearly has a different level of shell preservation to Type 1 & Type 2 sites - 6 of the units fall into the 4 - 6 category showing reasonable preservation and 6 units fall in the 10 - >15 class, which have good preservation.

In order to determine whether there were statistically significant taphonomic differences between site Types 1, 2 & 3 the chi-squared test was applied to the data. 'Goodness of fit' was based on the ratios of the mass of whole shell (g) (identifiable to species) to comminuted shell (g). The results were categorised according to two variables, namely site types (i.e. 1, 2, 3) and state of preservation (i.e. good 10> or poor <10). The chi-squared significance test for this data is given in Table 5.2 below.

The results clearly illustrate that the rates of shell fragmentation are not the same for site Types 1, 2 & 3. Shell fragmentation is highest overall for site Types 1 & 2. At site Type 3, namely BBF 6, the preservation of shells varies almost equally between 'good' and 'poor'.

H_0: The taphonomy of Site Types 1, 2 & 3 is the same

H_1: The taphonomy of Site Types 1, 2 & 3 is different

Site Types	**Good preservation**	**Poor preservation**	**Row Total**
1	0	9	9
2	0	7	7
3	6	6	6
Column Total	6	22	22

Expected value	0	22	
2	0	7	7
Site Types	**Good preservation**	**Poor preservation**	**Row Total**
1	0	9	9
Expected value	0	22	
3	6	6	6
Expacted value	6	22	
Column total	6	22	22

Calculation Table for obtaining chi-squared value

Category	O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)^2}{E_i}$
1	0	0	0	0	0
2	9	22	-13	169	8
3	0	0	0	0	0
4	7	22	-15	225	10
5	6	6	0	0	0
6	6	22	-16	256	12
				X^2 =	**30**

No. of degrees of freedom	2
Significance level	$\alpha = 0.05$
Chi-squared tabulated value	5.99

$X^2_{calc} = 30 > X^2_\alpha$, **reject Ho**

Table 5.2: Chi-squared test for goodness of fit between site type and taphonomy based on ratio of mass of whole or part-whole shell (identifiable to species) (g) to mass of comminuted shell (g) .

A second chi-square test was applied to the shell mass data to determine whether shell preservation was similar in single occupation and multiple occupation sites. The results were categorised according to two variables, namely site types (i.e. single or multiple occupation) and state of preservation (i.e. good >10 or poor <9). The chi-squared significance test for this data is given in Table 5.3 below.

H_0: The taphonomy of single occupation and multiple occupation sites is the same

H_1: The taphonomy of single occupation and multiple occupation sites is different

Occupation	**Good preservation**	**Poor preservation**	**Row Total**
Single	0	6	6
Multiple	6	16	22
Column Total	6	22	28

Occupation	**Good preservation**	**Poor preservation**	**Row Total**
Single	0	6	6
Expected value	0	22	
Multiple	6	16	22
Expected value	22	30	
Column total	6	22	28

Calculation Table for obtaining chi-squared value

Category	**O_i**	**E_i**	**(O_i-E_i)**	**$(O_i-E_i)^2$**	**$\frac{(O_i-E_i)^2}{E_i}$**
1	0	0	0	0	0
2	6	22	-16	256	12
3	6	22	-16	256	12
4	16	30	-14	196	7
				X^2 =	**31**

No. of degrees of freedom 1

Significance level $\alpha = 0.05$

Chi-squared tabulated value 5.99

$X^2_{calc} = 31 > X^2_{\alpha}$, **reject Ho**

Table 5.3: Chi-squared test for goodness of fit between single occupation and multiple occupation sites based on ratio of mass of whole or part-whole shell (identifiable to species) (g) to mass of comminuted shell (g) .

Discussion

Shell fragmentation is lowest in the Type 3 site, BBF 6, although there is some variation in preservation between units. Interestingly, the BBF 6 units in which the shell is least preserved all contain charcoal or evidence of hearths; those which are best preserved do not contain evidence of fires. The reasons for these differences are not clear, particularly in view of the small area of the site excavated. However, one factor may be the effects of various site activities. If a layer contains a hearth then it is reasonable to assume that shellfish were being processed and cooked on site - in effect that layer could be regarded as a short term single occupation layer. The presence of a hearth in a layer may be associated with burning of the shells and/or increased trampling of shells resulting in greater fragmentation.

Whole shell/ comminuted shell ratios for BBF 6 units containing hearths are very similar to single occupation sites in the dune area (BBF 2, 3, 5), and also to BBF 9, suggesting that shell fragmentation rates are similar in single occupation sites which are occupied for short periods of time. The two exceptions in this category are BBF 1 & 5 and the reasons for these differences are discussed above.

The highest fragmentation of shell occurs in multiple occupation sites, irrespective of their location. Sites included in this category are BBF 7\1, 7\2, 7\3, BBC L1, BBC L2, and BBC L6. Three layers in the cave site, BBC L3, L4 & L5, have marginally better shell preservation than the latter sites which may relate to the high density and /or rapid deposition of the deposits in these layers.

5.5: ANALYSIS METHODOLOGY

Specific analytical procedures were followed for the various elements recovered from each assemblage. Details of the methodology used for analysing shellfish are given in Chapter 6; other faunal remains in Chapter 7 and cultural artefacts in Chapter 8.

Generally the various components of each assemblage were easily sorted for later analysis with the exception of the BBF 1 deposit. Encased in a hard, calcretised breccia it was impossible to separate the individual components of the assemblage by the usual method of hand sorting. A trial was carried out by immersing a section of the assemblage in a mild, acetic acid but the solution dissolved only the calcrete matrix on the surface and not the underlying layers. Finally, the BBF 1 assemblage was separated by careful removal of the matrix surrounding an item with a dental pick and drill and then individually washing and cleaning each component.

5.6: Textural analysis of sediment samples

Introduction

Sediment samples were collected at three sites, BBF 4, 7 & BBC. All the analyses were carried out by Dr Duncan Miller at the Geology Department, University of Cape Town.

The objectives of the sediment collections were different for each site. At BBF 4 two samples were collected, one from Square BD 7 located on the talus slope and one from BD 51 located within ostensibly *in situ* deposit. The purpose of the collection was to determine whether a material distinction could be made between the apparent *in situ* matrix and that on the talus slope.

Due to the presence of a dense, compact humic palaeosol at BBF 7 it was thought that its formation might relate to the existence of a palaeovlei. Sediment was collected from Layers 7/1, 7/2 & 7/4. The upper layer appeared to be aeolian dune sand and this sample was collected for use as a comparative measure to determine, firstly, whether the sediments of Layer 7/2 & 7/4 were materially different from that of the upper layer and, secondly, were sufficiently fine to be regarded as vlei deposits. The lower samples were also examined for the presence of fresh-water molluscs.

Layer 7 at BBC lies beneath the aeolian sand deposits (now known as BBC Hiatus cf. Henshilwood *et al* 2001a) which characterise the lowest LSA deposits at the cave, and directly above Layer 8 which contains MSA material. This was a particularly soft and organic layer which was not noted elsewhere during excavation and is confined to the squares at the rear of the cave. It was thought that textural analysis of a sample might provide some information relating to the formation of sediments at the cave in the hiatus period between the LSA and the MSA.

Results

The criteria for typical sand sizes are => 2 mm or 63 microns and mud/silt < 63 microns. Based on these criteria all the samples, except that from BBC, Layer 8/7, are typically sand, that is they have a greater than 90% composition of sand. Layer BBC L7 is typically a muddy sand having just over a 50% sand composition. The sample collected from BBF 4, Square BD 7 located on the talus contained clean quartz and small pieces of abraded shell. Dirty quartz grains, minute pieces of shell and echinoid spines characterised the sample from the *in situ* deposit in Square BD 51 at BBF 4. Sediment from Layer 7/1 (YSL) at BBF 7 contained clean quartz, abraded echinoid spines and small fragments of shell. In contrast, the sediment in Layer 7/2 (Hl1) and 7/4 (HL3) was dirty but also consisted of uniform-size quartz crystals. The BBC sample consisted of clear, quartz grains of a uniform size, minute pieces of shell, calcite globules, abraded echinoid spines and a large amount of organic material which dissolved in H_2O_2.

All the sand fractions sent for sampling show a similar profile in a settling tube and the grain size was that of medium sand (1-2 phi). Sorting of the sand is generally very good (± 0.35 phi) which means there is a very small size distribution among grains. Plotted results show that the skewness of all the samples is either very slightly positive or negative meaning that the sand fractions have neither significantly fine nor coarse tails. No subordinate trend is therefore observable in the samples.

After fine sieving the sediment collected from BBF 7 was examined for the presence of freshwater molluscs by Dr. John Pether at the Iziko-South African Museum. Only terrestrial gastropods, naturally occurring in the area at present, were identified indicating that the humic layers at BBF 7 are not due to sedimentation in a palaeovlei. All the indications are that the sediments from the three BBF sites sampled are of marine origin, that is beach sand which has been wind transported over no great distance to its present position. Although wind transported sediments have a fine tail, the lack of this tail can be attributed to leaching of the sediments post-depositionally. A coarser tail is present in the sample from BBC than in the other samples but the reason for this is not clear, although some post-depositional alteration in the sediment content can be deduced from the profile which contains almost 50% fines.

Discussion

Quartz grains of a similar size make up the major part of the sediments collected from all the sites with the exception of the BBC sample. All the sand is of marine origin and has not been transported a great distance suggesting that the present source of the dune sand at BBF is the nearby Blombos Beach situated to the west, although at times of lowered sea levels in the past a greater supply of sand may have been available from an exposed marine peneplane.

The presence of dirt and consequent staining of the sediment collected from the *in situ* deposit at BBF 4 clearly distinguishes it from the talus sediment. This observation confirms that the central portion of the deposit at the site is still contained within its original ash and organic matrix, suggesting that it is *in situ*. Material on the talus has been relocated due to the actions of wind and water erosion.

At the BBF 7 site, the upper layer 7/1 (YSL) sediments shows no sign of staining. The surrounding matrix is clean quartz sand indicating that the assemblage was deposited after the formation of the underlying humic deposits and probably at a time when the surrounding dune fields were active and the area not heavily vegetated. Quartz crystals of a similar size to those recovered from the upper 7/1 (YSL) layer characterise the two lower humic layers 7/2 (HL1) and 7/4 (HL3), but the sediment is dirty and stained. During the period of occupation of the lower layers the dunefield was probably stable and more heavily vegetated than during the Layer 7/1 occupation, but the presence of a palaeovlei here is unlikely.

During the hiatus period between the LSA and MSA occupations a humic rich layer of material was deposited within the BBC site. It is highly likely that during periods of lower sea level in the Late

Pleistocene and early Holocene the entrance to the cave was blocked by aeolian marine sands (Jacobs *et al* 2006). A layer of hyrax dung, removed from the surface of the cave prior to excavation, confirms this practice and suggests that the humic material in Layer 8/7 is comprised, at least partially, of hyrax coprolites. Hyraxes, *Procavia capensis*, habitually occupy crevices and caves along this section of the coast and may have used the cave once a small opening was revealed, perhaps after the mid-Holocene.

5.7: Radiocarbon Dating

Sixteen shell and charcoal samples collected *in situ* from BBF sites, were submitted to the CSIR, Pretoria for radiocarbon dating (Table 5.4).

The C-14 half-life used is 5568 years. Ages are corrected for variations in isotope fractionation and calibrated shell dates are corrected for the marine reservoir effect; 400 years should be subtracted from uncalibrated shell dates to correct for the marine reservoir effect. Age has also been calibrated for the southern hemisphere with the Pretoria programme (Talma & Vogel 1993). The calibrated date is the most probable calendar date, with 1 sigma dates also listed. Funding for the sixteen radiocarbon dates was supplied by The Swan Fund, Oxford.

Two sheep bone samples recovered from Layer 5 & 6 at BBC were submitted to the Oxford University radiocarbon accelerator unit for dating (Table 5.5; Henshilwood 1996). The dates are uncalibrated in radiocarbon years B.P. using the half life of 5568 years. Corrections have been made for isotopic fractionation. Calibrated dates use the calibration curve of Stuiver & Pearson (1993) plus 40 years for the southern hemisphere.

Site	**Layer**	**Unit**	**Sq.**	**Ref. No.**	**Dating Material**	**^{14}C Age BP**	**±**	**1σ**	**Calib-rated Date**	**1σ**	**BC/ AD**
BBF 1			B1	Pta-6177	Shell	**6960**	70	5437	**5363**	5308	BC
BBF 2			I3	Pta-6181	Shell	**6740**	70	5230	**5198**	5123	BC
BBF 3			B2	Pta-6180	Shell	**5960**	70	4361	**4322**	4241	BC
BBF 4			DB21	Pta-6176	Shell	**5680**	70	4046	**3985**	3942	BC
BBF 5			C2	Pta-6182	Shell	**5520**	70	3928	**3802**	3751	BC
BBF 6		6/12HBL		Pta-6178	Shell	**4070**	60	2064	**1981**	1899	BC
		6/2 ASBA		Pta-6709	Shell	**3630**	70	1468	**1399**	1327	BC
BBF 7		7/1YSL	B2	Pta-6179	Shell	**3110**	50	835	**801**	776	BC
		7/4HL3	B2	Pta-6183	Shell	**3170**	25	888	**846**	826	BC
BBC	5	MC4	E4	Pta-6185	Charcoal	**1840**	50	135	**225**	254	AD
	5	MC4	E4	Pta-6175	Shell	**2400**	40	27	**74**	115	AD

	5	MC4	E4	Pta-6246	Shell	**2280**	50	84	**133**	198	AD
	5	MC4	E4	Pta-6247	Shell	**2340**	50	84	**133**	198	AD
	1	COK	E4	Pta-6184	Charcoal	**290**	20	1646	**1651**	1657	AD
BBF 9		OH	A2	Pta-6187	Charcoal	**480**	45	1426	**1443**	1461	AD
		OH	A2	Pta-6248	Shell	**940**	50	1462	**1493**	1531	AD

Table 5.4: Blombosfontein Nature Reserve: Shell & charcoal radiocarbon dates.

Layer	**Skeletal Part**	**Reference No.**	**Uncalibrated radiocarbon determination (B.P.)**	**Calibrated 1σ date range**	**$\delta^{13}C$**
5	Left mandible	OxA-4543	1960 ± 50	3 -89 AD	-12.6
6	Calcaneum	OxA-4544	1880 ± 55	82-215 AD	-12.9

Table 5.5: BBC: Sheep bone accelerator radiocarbon dates

5.8: Summary

Archaeological sites of Holocene age are scattered along the coastline between the Duivenhoks and Goukou Rivers. Further sites are found within the De Hoop Nature Reserve to the west of Cape Infanta.

Based on a set of criteria which fulfilled the objectives of this project the BBF area was selected for more detailed investigation. A total of 21 Holocene sites were recorded at BBF and 9 selected for excavation. Six of those sites selected were situated in the BBF dunefields on a coastal foreland, and three on the seaward side of the southerly coastal cliffs.

All the sites selected were surveyed, drawn and measured and excavation commenced in October 1992. Detailed notes were kept and photographs taken during the excavations. Five of the sites, BBF 1-5, were single occupation units and four sites, BBF 6, 7, 9 and BBC showed stratigraphic evidence of repeated use. Excavations at BBF and BBC were completed in February, 1993.

Detailed descriptions of sites and, where applicable, stratigraphic units given in this chapter illustrate diversity in site location, size, type, use and content. A distinct difference is observable between open middens and shelter sites in the preservation of organic materials, particularly bone.

A textural analysis of sediment samples from three BBF sites provided useful evidence relating to aspects of site formation. At the BBF 4 site a clear distinction could be made between *in situ* and talus deposit. The suspected presence of a palaeovlei at BBF 7 was refuted by the evidence which pointed rather to the presence of dense vegetation during the period this site was occupied. A compact, organic palaeosol, uncharacteristic of other excavated layers at BBC, separated the LSA and MSA units. Textural analysis of these BBC layer L7 sediments indicated the presence of a high percentage of fine material in association with quartz sand of marine origin. This humic material is attributed to the deposition of hyrax coprolites during a hiatus occupation period in the cave, and may be associated with the closure of the cave entrance.

All the sediment analysed contained quartz crystals of a similar size and were of marine origin. Blombos Beach, situated to the west of BBF, and a larger marine peneplain which existed during the Late Pleistocene and Early Holocene, are the most likely source of the aeolian sands which constitute the BBF dunefield.

Radiocarbon dates for the BBF sites were obtained from charcoal, shell and bone. The earliest site, BBF 1, dates to 6960 ± 70 B.P. and the youngest, BBF 9, to 290 ± 20 B.P. The balance of the excavated sites at BBF are spaced fairly evenly between the oldest and youngest dates. Some pulsing is observable at around 6000 B.P., with five sites dating to between 5520 B.P. and 6960 B.P. Dates from the BBF 6 site show it was in use between 4070 B.P. (Layer 6\12) and 3630 B.P (Layer 6\2) and BBF 7 between 3170 B.P. (Layer 7\4) and 3110 (Layer 7\1). Evidence of occupation of the BBF area after 2000 B.P. is provided by the excavated units at BBC and BBF 9. However, only the top and lower layers of BBC were dated and the dates for the middle layers are not known, but it can be assumed they fall within the range of the upper and lower dates.

Accelerator radiocarbon dates of 1960 ± 50 B.P. and 1880 ± 55 B.P. obtained on sheep bone from BBC are the earliest dates for sheep obtained by this direct method for the western, southern and south-western Cape (Henshilwood 1996) and point to an early arrival for herding in the region.

CHAPTER 6

SHELLFISH ANALYSIS

6.1: Introduction

The rocky sections of the southern Cape coastline are richly endowed with a wide range of marine fauna, most of which is edible by humans (Tietz & Robinson 1974; Branch & Branch 1981; Inskeep 1987; Branch *et al* 1999; Deacon & Deacon 1999; Henshilwood *et al* 2001). Hunter gatherers who visited the BBF area during the Holocene utilised a wide range of marine species for food and some of this diversity is reflected in Chapter 7. Although we are only able to reflect on the fauna which leaves traces in the archaeological deposits, the range of marine fauna that was utilised by hunter gatherers is undoubtedly far greater than the record shows. Some examples of marine organisms eaten by local residents in the southern Cape today, and which would be mostly undetectable in the BBF deposits, include octopus (*Octopus granulatus*), red bait (*Pyura stolifera*) which is stewed by local farmers and said to be highly nutritious (*cf.* Bigalke 1973), sea cucumbers (e.g. *Cucumaria sp.*), rock crabs (e.g. *Cyclograpsus punctatus*) (evidence of crabs seldom survives as the soft shells are easily fragmented), and possibly some species of cartilaginous fishes (e.g. catsharks of the *Scyliorhinidae* family) (*cf.* van der Elst 1988; Heemstra & Heemstra 2004). In environments, such as the southern Cape, where marine species diversity is high (Branch & Branch 1981; Branch *et al* 1999), it may therefore be imprudent to make attempts at calculating, for instance, band size or length of stay at a site based on the marine derived kilojoules provided by shellfish only. At best a study based on the surviving marine evidence from archaeological deposits can represent only a portion of the whole spectrum of marine species likely to have been exploited (*cf.* Bailey 1983; Henshilwood 2001a).

Shellfish are a highly sustainable commodity, being sessile are easily gathered, and provide a reliable source of high protein food. On the rocky, southern Cape shores shellfish species are regularly zoned in bands, namely the Littorina, Upper Balanoid, Lower Balanoid, Cochlear and Infratidal zones (Branch & Branch 1981; Branch *et al* 1999)(Figure 6.1). As these zones coincide with the positions of the spring and neap tide high and low phases it means that, usually, a more limited range of shellfish species can be gathered during the neap low tides. During spring low tide a wider choice of species are exposed or available. By analysing the shellfish species found at BBF sites we are able to surmise which bands of the rocky shore were exploited by humans and also the likely tidal situation at the time the shellfish were collected. Some caution is needed, though, as tidal conditions in this area can vary considerably depending on the sea, weather and season. In almost all cases, however, species located in the Cochlear and Infratidal zone can only be gathered during ideal spring low water conditions.

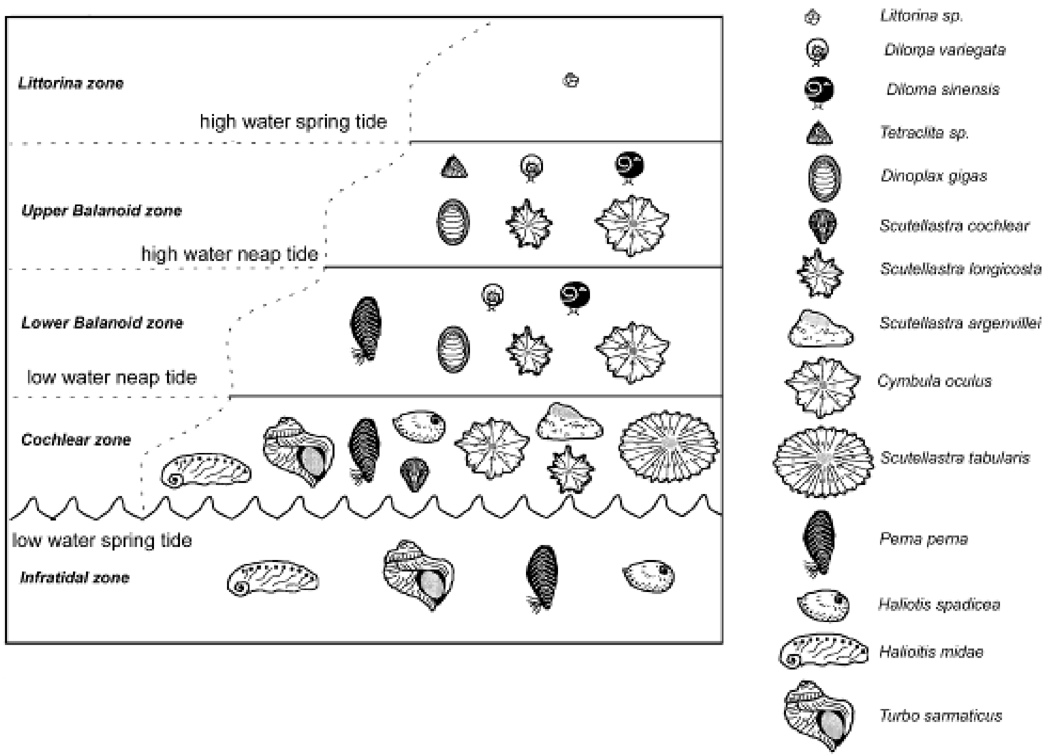


Fig. 6.1. Rocky shore: South coast zonation

Shellfish are the best preserved and most ubiquitous of the faunal remains found at all the excavated BBF sites. As such they provide the most appropriate material for examining one aspect of the subsistence strategies of the BBF inhabitants, albeit only from a marine perspective.

Prior to the commencement of excavations the objectives of the shellfish aspect of the BBF study were formulated. The location and size of excavations at each site was designed, where possible, to sample the range of shellfish species at a site, but also to recover a sample reflecting the relative and absolute quantities of each element which might be distributed at various locations across the site (*cf.* the objectives of the Oronsay excavations, Mellars 1987). In the case of site excavations which, in extent, were spatially limited, for example BBC and the brecciated site BBF 1, this was not possible but the relatively greater volumes of shellfish recovered from each excavated unit at these sites provide some compensation for this lack of spatial control.

The primary objectives of the BBF shellfish analysis were formulated as follows:

1. To establish the range of shellfish species exploited at each of the nine excavated sites and within each of the distinct occupation units and to quantify these both in terms of relative and absolute values.

2. To compare, on an equitable basis, the species ranges and relative and absolute quantities of a species from each site/unit with those of other BBF sites/units, taking into account spatial and temporal variations and site types (*cf.* Ch. 5).

3. To determine from the shellfish species represented at each site/unit the range of inter-tidal zones exploited and to ascertain whether there is a relationship between site age and/or location and the inter-tidal zone exploited.

4. To examine whether there is a spatial and/or temporal relationship between the size of measured shells for selected species recovered from the various BBF sites, and whether size differences may relate to human predation pressure or palaeoenvironmental factors or both.

5. To compare the range of shellfish species exploited at all BBF sites to that likely to have been available for exploitation on the BBF coastline, taking into account seasonal availability and palaeoenvironmental factors such as rising and falling sea levels, sea temperature changes and changes in the morphology of the coastline.

In order to satisfy the objectives of the study it was essential to establish what the shellfish project aimed to accomplish prior to the commencement of fieldwork and laboratory analysis. To meet these objectives a programme was drawn up stating the mimimum data which would be required, namely, the range of species exploited by site/unit, the shell weights (g) and MNI's per species per site/unit and the individual shell measurements by species for each site/unit (for more details *cf.* Section 6.2 below).

6.2: Analysis Methodology

The shellfish recovered from 9 BBF sites, comprising 28 units, forms the basis for this study. All whole shells or shell fragments larger than 1.5 mm in size were retained, initially in bulk, for later sorting and identification, where possible, to species. MNI's were calculated and the shell weight (g) of a species recorded for each unit (*cf.* Table 6.1 & Table 6.2 below); additionally all whole shells were measured. A distinction was made between 'food' shellfish species and those species unlikely to have been eaten but that were incidentally carried to a site attached to larger shells or by some other means (Table 6.3). For instance, certain species of juvenile *Patella* attach themselves to mussels to avoid detection; other shell species live among the byssus threads of mussels; *S. cochlear* juveniles live on adult shells; juvenile *S. longicosta* attach themselves to winkles (Branch & Branch 1981; Branch *et al* 1999). It is possible that some of the smaller shells were deliberately collected, perhaps to be used for decorative purposes; for example, *Nassarius kraussianus* shells recovered from Nelson Bay Cave were deliberately pierced, perhaps to be threaded and worn as necklaces, arm bands or sown to garments (Inskeep 1987:178). However, unless a shell displayed evidence of deliberate human alteration (*cf.* Ch. 8 for examples) it was classified either as 'food' or incidental. Fragments and unidentifiable pieces of comminuted shell were listed as shell residue (*cf.* Ch. 5).

Species >	*Haliotis midae*	*Haliotis spadicea*	*Perna perna*	*Donax serra*	*Dinoplax gigas*	*Chiton crawfordi*	*Scutellastra argenvillei*	*Scutellastra cochlear*	*Scutellastra tabularis*	*Patella barbar a*	*Scutellastra longicosta*
Site	n	n	n	n	n	n	n	n	n	n	n
BBF 1	1	15	50	2	0	0	0	0	2	5	10
BBF 2	0	166	842	5	1	8	0	0	1	2	155
BBF 3	4	74	112	2	5	2	0	2	79	37	498
BBF 4	1	3	14	26	9	3	0	2	22	2	333
BBF 5	0	0	7	0	0	0	2	3	71	3	38
BBF 6/1	1	25	4	0	0	1	10	53	1	6	57
BBF 6/2	1	19	94	0	0	1	9	129	1	1	59
BBF 6/3	0	19	37	0	0	3	4	23	0	0	16
BBF 6/4	2	29	21	0	0	3	5	12	1	0	17
BBF 6/5	1	11	2	0	0	1	2	3	0	0	22
BBF 6/6	1	10	1	0	0	4	5	5	0	1	20
BBF 6/7	0	11	4	0	0	2	0	7	0	2	12
BBF 6/8	1	302	38	0	0	1	1	5	1	0	22
BBF 6/9	0	1	33	0	0	0	0	1	0	2	5
BBF 6/10	0	1	0	0	0	0	0	0	1	0	1
BBF 6/11	0	2	0	0	0	1	1	0	1	0	54
BBF 6/12	0	6	2	0	0	1	0	0	1	0	36
BBF 7/1	0	11	302	0	0	0	4	15	1	7	119
BBF 7/2	0	8	151	0	0	0	0	0	0	1	20
BBF 7/3	0	10	212	0	0	0	3	0	0	2	28
BBF 7/4	0	45	307	0	0	0	1	6	1	8	60
BBC L1	1	3	7	0	0	0	0	8	0	0	0
BBC L2	0	9	42	4	1	5	5	68	0	0	32
BBC L3	0	0	5	0	0	0	2	15	0	0	5
BBC L4	0	65	270	4	0	4	27	419	0	2	191
BBC L5	0	13	31	0	0	1	2	149	0	0	44
BBC L6	0	0	8	1	0	1	0	34	0	0	8
BBF 9	9	64	52	0	16	12	18	1	3	1	20

Table 6.1: MNI of all shellfish species from BBF units

Species >	*Haliotis midae*	*Haliotis spadicea*	*Perna perna*	*Donax serra*	*Dinoplax gigas*	*Chiton crawfordi*	*Scutellastra argenvillei*	*Scutellastra cochlear*	*Scutellastra tabularis*	*Patella barbara*	*Scutellastra longicosta*
Site	g	g	g	g	g	g	g	g	g	g	g
BBF 1	25	223	278	18	0	0	2	0	163	51	259
BBF 2	0	1741	4417	15	3	7	0	0	164	26	3350
BBF 3	171	824	414	3	11	3	14	24	4472	1046	7896
BBF 4	131	66	14	28	12	0	0	21	1696	34	3755
BBF 5	0	7	6	0	0	0	36	21	5671	124	350
BBF 6/1	149	221	14	0	0	0	155	429	78	88	587
BBF 6/2	61	228	786	0	0	1	130	1071	126	24	803
BBF 6/3	0	181	290	0	0	1	60	216	0	0	239
BBF 6/4	97	338	300	0	0	3	101	130	34	0	306
BBF 6/5	34	0	43	0	0	2	35	30	0	0	582
BBF 6/6	36	58	1	0	0	3	114	48	0	75	410
BBF 6/7	2	127	65	0	0	1	0	53	3	8	239
BBF 6/8	29	273	452	0	0	0	16	43	49	0	362
BBF 6/9	3	24	228	0	0	0	0	10	1	7	66
BBF 6/10	0	4	6	0	0	0	0	0	80	0	9
BBF 6/11	0	20	0	0	0	0	31	0	124	0	797
BBF 6/12	0	52	10	0	0	0	1	0	95	0	491
BBF 7/1	0	109	944	0	0	0	68	87	59	125	1058
BBF 7/2	0	42	438	0	0	0	2	2	4	11	253
BBF 7/3	0	76	1022	0	0	0	57	0	18	36	430
BBF 7/4	0	418	2402	0	0	0	20	60	67	165	814
BBC L1	20	18	38	0	0	0	12	50	0	0	19
BBC L2	0	51	92	14	0	1	99	516	0	0	467
BBC L3	0	0	0	0	0	0	15	129	7	0	57
BBC L4	8	544	2284	16	0	1	571	3298	0	49	2561
BBC L5	0	134	251	0	0	0	33	1160	0	0	664
BBC L6	0	3	0	0	0	0	0	287	0	0	106
BBF 9	480	619	330	0	60	23	317	3	168	10	331

Table 6.2: Mass (g) of all shellfish species from BBF sites

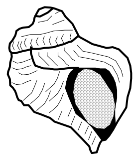
Site no. >	BBF 1	BBF 2	BBF 3	BBF 4	BBF 5	BBF 6	BBF 7	BBC	BBF 9
	n	n	n	n	n	n	n	n	n
Species									
Assiminea ovata								1	

Austramitra sp.							1	
Austromegabalanus cylindricus							5	
Barbatia obliquata			1				1	
Burnupena cincta		3	1		3		4	7
Calliostoma africanum							1	
Calliostoma sp.							1	
Chlamys tincta							11	
Clionella taxea							1	
Coronula diadema								2
Crepidula porcellana							1	
Cthalamus dentatus					1			
Dendrofissurella scutellum					1	1		
Diadora sp.							2	
Duplicaria capensis							2	
Fauxulus capensis							1	
Fauxulus capensis						1		
Fissurella mutabilis	1				1		7	
Gibbula sp.							2	
Helcion pectunculus	1						7	
Helcion pruinosus		1					3	
Helcion sp.	3	1						
Homalopoma quantillum							1	
Lasaea adansoni turtoni							1	
Limaria rotundata						55	1	
Littorina knysnaensis							6021	
Macoma litoralis							1	
Nassarius kraussianus							388	
Nucella cingulata							2	
Nucella squamosa	3				1		6	1
Ocenebra babingtonii							3	
Ocenebra fenestrata	2						6	
Ocenebra purpuroides							1	
Ocenebra scrobiculata	1				1		8	1
Octomeris angulosa							1	
Ostrea sp.	1					1	2	
Diloma variegata							11	
Reclusia rollandiana							1	
Sheldonia cotyledonis								
Siliquaria wilmanae								
Siphonaria aspera								1
Siphonaria capensis								
Siphonaria concinna							1	1
Terebra suspensa							1	
Tetraclita serrata					2			
Thais castanea							3	
Thecalia concamerata							2	
Trachycystis bisculpta						1		
Trachycystis capensis						1		
Tricolia capensis							2	
Trimusculus costatatus								2
Tropidophora ligata						1	2	

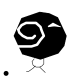
Turbo cidaris			2
Turritella carinifera	2	1	20
Venus verrucosa	1		1
Vermetus sp.			1

Table 6.3: MNI's of 'incidental' shellfish species recovered from BBF sites

Gastropoda

Turbo sarmaticus 

Unit values for *Turbo sarmaticus* were derived by counting the numbers of columella and opercula; the highest respective value was regarded as the MNI. Opercula lengths were recorded and the height of whole *Turbo* shells measured from the apex to the outside edge below the shell opening (following the method of Yssel 1989:16).

Diloma sp **.** 

Initially an attempt was made to separate the *Diloma* sub-species (i.e. *D. sinensis, D. tigrina & D. variagata*) and to count the columella for each species. However, due to the small size of the shells and high breakage patterns (probably in the process of meat extraction) it was realised that this approach was too inaccurate and an alternative method was sought.

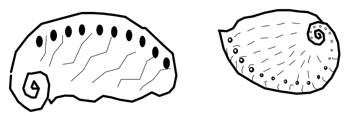
On five separate occasions 100 live *Diloma sp*. were collected from random locations in the Upper and Lower Balanoid Zone. Generally, there was some skewing in the collection process towards larger animals but no particular preference was given to the sub-species chosen, although *D. sinensis* occurred most commonly. Similarly, *D. sinensis* was the dominant *Diloma sp.* recovered from BBF sites. The collected sample was boiled to remove the meat, the shells were washed and left to dry in the sun for one week. Each batch of dry shells was then weighed. The results are listed in Table 6.4 below.

Diloma sp. shells for each excavated unit were weighed and the mass (g) divided by the mean mass of the 500 samples listed below (i.e. 542 g) to calculate MNI's.

Sample No.	n	Dry Shell Mass (g)
1	100	511
2	100	535
3	100	552
4	100	552
5	100	559
	Mean	**542**

Table 6.4: *Diloma sp*.: Dry mass (g) of 5 x 100 shells

Haliotis midae & Haliotis spadicea



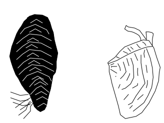
The two sub-species of *Haliotis sp*. were separated and MNI's calculated on the number of apices; shell mass was recorded.

Patellidae

Patella/Scutellastra were sorted to species and MNI values calculated by counting the number of apices. The lengths of unbroken limpet shells were measured and the total mass of shell (g) identified to a species was recorded.

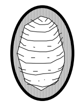
Bivalvia

Perna perna & Donax serra



MNI values for *Perna perna* and *Donax serra* were calculated by using hinges, separating left and right sides. The lengths of whole shells for both species were measured. An attempt was made to determine the original lengths of broken *Perna perna* shells using the method advocated by Hall (1980) which examines the relationship between measurements of the pedal retractor muscle scar and the length of the complete specimen. In almost all specimens examined the pedal retractor scar was obscured by calcium carbonate deposits and the method was therefore not considered satisfactory for establishing the length of the broken mussel shells from BBF sites.

Polyplacophora

Dinoplax gigas & Chiton crawfordi 

The plates of chitons are divided into terminal and medial groups. Frontal and terminal plates were sorted according to species and size and MNI's established. All the recovered shell plates were weighed.

6.3: Shellfish analysis by site/unit

The first objective was to establish the total range of shellfish which was collected by the inhabitants of each of the units or layers at all nine of the excavated BBF sites, and to quantify these in terms of relative and absolute values. Two approaches were adopted, firstly to calculate MNI's and secondly the weight (g) of shell for each species. The reason for adopting both methods is that different sets of information or patterning are reflected by MNI's and by weight. For example, a high number (MNI) of the small winkle, *Diloma sp.* conversely has a relatively small weight (g). If the dominant species for a site was calculated using the MNI method only, it would elevate *Diloma sp*., which was collected in large numbers, to a prominent position. A much larger gastropod, such as *Turbo sarmaticus,* which may have contributed a substantially higher meat weight, but had a lower MNI count, may then appear to be under-represented. Ideally, the flesh weight of each individual of a species should be calculated for all sites and cross-comparisons made on this basis, but a project of this magnitude was beyond the scope of this study. In the event, the overall patterning in species diversity and dominance for each site/unit, and across sites/units, became clearer when both MNI and mass tables were considered together and this approach was considered satisfactory.

The results of the elementary shellfish analysis are presented in Tables 6.1 & 6.2 above. Fifteen species of shellfish were exploited by the BBF inhabitants for food although the whole range of species is not found at all sites. Only two species, *Turbo sarmaticus* and *Diloma sp*. occur at all sites/units; other shellfish commonly gathered for food include *Haliotis spadicea, Perna perna*, and various *Patella sp.* The rarest shellfish are *Patella granularis*, *Chitons*, *Haliotis midae* and *Donax serra*.

6.4: Inter-site/unit shellfish analysis

The objective of this part of the shellfish study was to compare, on an equitable basis, the species ranges and relative and absolute quantities of a species from each site/unit with those of other BBF sites/units taking into account spatial and temporal variations and site types.

Establishing an equal basis which allows for inter-site or inter-unit comparisons of assemblage components is a common problem encountered by archaeologists. One of the more usual methods is to record the total volume of deposit excavated from a unit (e.g. bucket counts converted to mass per cu. m.) and to express the recorded mass or MNI of a component as mass per unit volume of excavated deposit, or MNI per unit volume of deposit , respectively (e.g. Voigt 1973, 1975; Buchanan *et al* 1984; Thackeray, J.F. 1988).

There are a number of drawbacks to this method; firstly the commodity we wish to study makes up a part of the volume of excavated deposit, therefore the resultant equation is influenced by the respective volume of that category we wish to analyse. Secondly, there are subjective decisions made during an excavation with regard to the amount of matrix recovered which surrounds the deposit. For example, the amount of dune sand recovered during the excavation of an open, single occupation dune site may vary, depending on the excavator. Seldom is the *in situ* deposit so clearly stratified that only that layer is excavated. Parts of the assemblage may migrate up into the overburden or into the underlying layers and inevitably sand from above and below the deposit will be included during recovery, thus increasing the volume of recovered deposit.

Thirdly, the mass of excavated deposit may be influenced by uncontrollable factors which falsely inflate the mass of deposit for a particular square or unit. For example, a single, large grindstone weighing several kilograms will add substantially to the total mass recovered from a single square or unit and may distort comparisons with other units or sites, particularly where stone is absent.

An alternative method was therefore sought which would allow for more objective inter-site/unit comparisons at BBF. The first step was to eliminate some of the background 'noise' contributed by shellfish species infrequently found at BBF sites.

Species >	***Haliotis spadicea***	***Perna perna***	***Scutellastra cochlear***	***Scutellastra tabularis***	***Scutellastra longicosta***	***Cymbula oculus***	***Diloma sp.***	***Turbo sarmaticus***
Site								
BBF 1	3	4			1	2		5
BBF 2	3	5			2	1		4
BBF 3		2		1	4		3	5
BBF 4				1	4	2	3	5
BBF 5				4	3	1	2	5
BBF 6/1	2		4		5	1		3
BBF 6/2		4	5		3	2		1
BBF 6/3	2	5	3		1			4
BBF 6/4	4	3	1		2			5
BBF 6/5	3	1	2		4			5
BBF 6/6	3	1	2		4			5
BBF 6/7	3	1	2		4			5
BBF 6/8	3	4			2	1		5

BBF 6/9		5	1	3	2	2	4
BBF 6/11	1			5	3	4	4
BBF 6/12	1			5	3	3	2
BBF 7/1		4		2	1	4	5
BBF 7/2	1	5		2		4	3
BBF 7/3		5		2	1	4	3
BBF 7/4	1	5		2		5	3
BBC L1	1	2			3	5	4
BBC L2		1	3		2	5	4
BBC L3		1	4		2	5	3
BBC L4		3	4		1	5	1
BBC L5			3			5	4
BBC L6		1	4	2		5	3
BBF 9	2	1		2	3	5	4

Table 6.5. Shellfish seriation of the 5 most common species per site/unit based on MNI's. Weighted values are in descending order of importance.

Species > / **Site**	***Haliotis spadicea***	***Perna perna***	*Scutellastra argenvillei*	***Scutellastra cochlear***	***Scutellastra tabularis***	***Scutellastra longicosta***	***Cymbula oculus***	***Diloma sp.***	***Turbo sarmaticus***
BBF 1	2	4			1	3			5
BBF 2	2	4				3	1		5
BBF 3					3	4	1	2	5
BBF 4					3	4	1	2	5
BBF 5					4	3	2	1	5
BBF 6/1	2		1	3		4			5
BBF 6/2	1	2		4		3			5
BBF 6/3	1	4		2		3			5
BBF 6/4	4	2		1		3			5
BBF 6/5		3	2	1		4			5
BBF 6/6	2		3	1		4			5
BBF 6/7	3	2		1		4			5
BBF 6/8	3	4			1	3			5
BBF 6/9	1	4				2	3		5
BBF 6/11	1				3	4	2		5
BBF 6/12					1	5	3	2	4
BBF 7/1		2				3	1	4	5
BBF 7/2		4				2	1	3	5
BBF 7/3		4				2	1	3	5
BBF 7/4	1	4				2		3	5
BBC L1		1		2			3	4	5
BBC L2				2		1	3	5	4
BBC L3				3		1	2	5	4
BBC L4				3		1	2	5	4
BBC L5				3		2	1	4	5
BBC L6				4		2	1	5	3

BBF 9	2	1					3	5	4

Table 6.6. Shellfish seriation of the 5 most common species per site/unit based on mass. Weighted values are in descending order of importance.

This was done by allocating values numbered from 5 - 1, in ascending order, to the five most common species for each site/unit. Thus, the most common species was allocated a weighting of 5, the next most common 4, and so on (Table 6.5 & 6.6). Juvenile *Patella* and unidentified *Patella sp*. were eliminated from the calculation. Species per site/unit were ranked both according to mass and MNI. By basing the weighted seriation on MNI's the number of shellfish species for all BBF sites/units is reduced to eight species (Table 6.5) and to nine species based on mass (Table 6.6). With the exception of *Scutellastra argenvillei*, the same species dominate in all the BBF sites, whether the weighting is based on MNI's or mass. *Turbo sarmaticus* is the most common shellfish found in all sites/units. Due to the very small number of shellfish recovered from BBF 6, Layer 10, this unit was removed from the data set.

Correspondence Analysis

Having established which were the most common shellfish species at BBF sites and given relative weightings to each per site/unit, the next stage was to identify which sites/units are similar or dissimilar to others in terms of their individual shellfish compositions and weightings. A potentially large number of variables are contained in the data set which comprises 27 sites/units and 8 species of shellfish based on MNI's, and 9 species based on mass. In order to interpret the patterning present in these data sets we need to compress the data into a smaller number of dimensions, ideally only two or three.

If all the sites/units were viewed in multi-dimensional space it would be difficult to interpret the data as many different perspectives are provided, depending on the angles from which each of the points are viewed. In order to reduce these dimensions to manageable proportions the orientation of the various directions or axes first needs to be defined, as well as the length of the longest axis. The next longest part of the point scatter can then be calculated with the proviso that the second axis is at right angles to the first. This procedure is repeated for each independent dimension in the space under consideration (*cf*. Bolviken *et al* 1982; Underhill & Peisach 1985; Shennan 1997; Henshilwood 1990).

Correspondence analysis allows us, in a low dimensional space, to simultaneously display the sites/units and the shellfish categories shown in the data matrix. It is a particularly useful method of multivariate analysis as no assumptions are made as to which variables are dependant or independent, thus allowing a direct measure of the similarities or differences, between and across each of the variables (Underhill & Peisach 1985). This factor is particularly important when analysing the BBF sites as it is not obvious which variables should be regarded as dependent, and which independent. From the scattergram produced, the patterning in the data can be visually appreciated allowing for recognition of clustering of sites/units, and also the relationship between sites/units and shellfish categories. The display of the data in two dimensions shows on the one hand those sites/units which are similar, and on the other the correlation between the shellfish categories (*cf*. Henshilwood 1990).

In order to appreciate the spatial relationship of each of the sites/units and shellfish categories we need to understand why they are clustered. The ranked, raw data matrix, shown in Tables 6.5 & 6.6, is converted by a set of mathematical equations into a simultaneous display of sites/units and shellfish categories using the DECORANA program. Due to a reduction in dimensionality from eight or nine dimensions to two some of the data's original integrity is lost. If the first principal component, defined as a comparison of sites/units and shellfish categories, is projected onto a single line (Axis 1), this becomes the principal axis of inertia and the maximum inertia (or line of closest fit) explains 42.7% of the total inertia.

Inertia describes the total amount of information in the data matrix (Underhill pers. comm.); geometrically, inertia may be thought of as weighted spread or dispersion (Greenacre 1981). By projecting the 27 sites/units onto a single line, 57.3 % of the inertia is lost. If a second component is introduced then the second axis, at right angles to the first, accounts for a further 27.2 % of the inertia. Thus by projecting 27 sites/units and 8 or 9 categories of shellfish onto two axes, and reducing them to two dimensions, the plane of the first two axes accounts for 69.9% of the total inertia; 30.1% of the inertia has been lost (Underhill & Peisach 1985; also *cf*. Henshilwood 1990).

Interpretation of the Scattergrams (Figs. 6.2, 6.3 & 6.4)

The information contained in Tables 6.5 & 6.6 is conveyed graphically in Figs. 6.2, 6.3 & 6.4 after conversion of the data by the DECORANA program. Underhill & Peisach (1985:55) have identified three basic principals for interpreting correspondence analysis scattergrams and these can be applied to the BBF data. Sites/units which cluster closely together tend to be similar in their profiles of shellfish categories, that is high values are associated with high values and vice versa. The same principle can be applied to the shellfish categories. Distances between a site/unit point and a shellfish category point have no interpretative value. The joint interpretation of shellfish category points, and site/unit points, is through the transition formulae contained in the DECORANA program. Thus, site/unit points on the scattergram are attracted away from the origin in the direction of the shellfish categories for which they have high scores. Site/unit points falling close to the origin have very average values for all the shellfish categories, or alternatively are poorly represented (*cf.* Underhill & Peisach 1985; Henshilwood 1990).

Note: Type 1 sites are open midden sites and pre-date 3000 B.P. Type 2 sites are shelter sites located in the coastal cliffs to the south of BBF and post-date 2000 B.P. The single Type 3 site, BBF 6, is a shellfish processing or extraction site located on a coastal promontory directly adjacent to the sea and dates to around 4000 B.P.

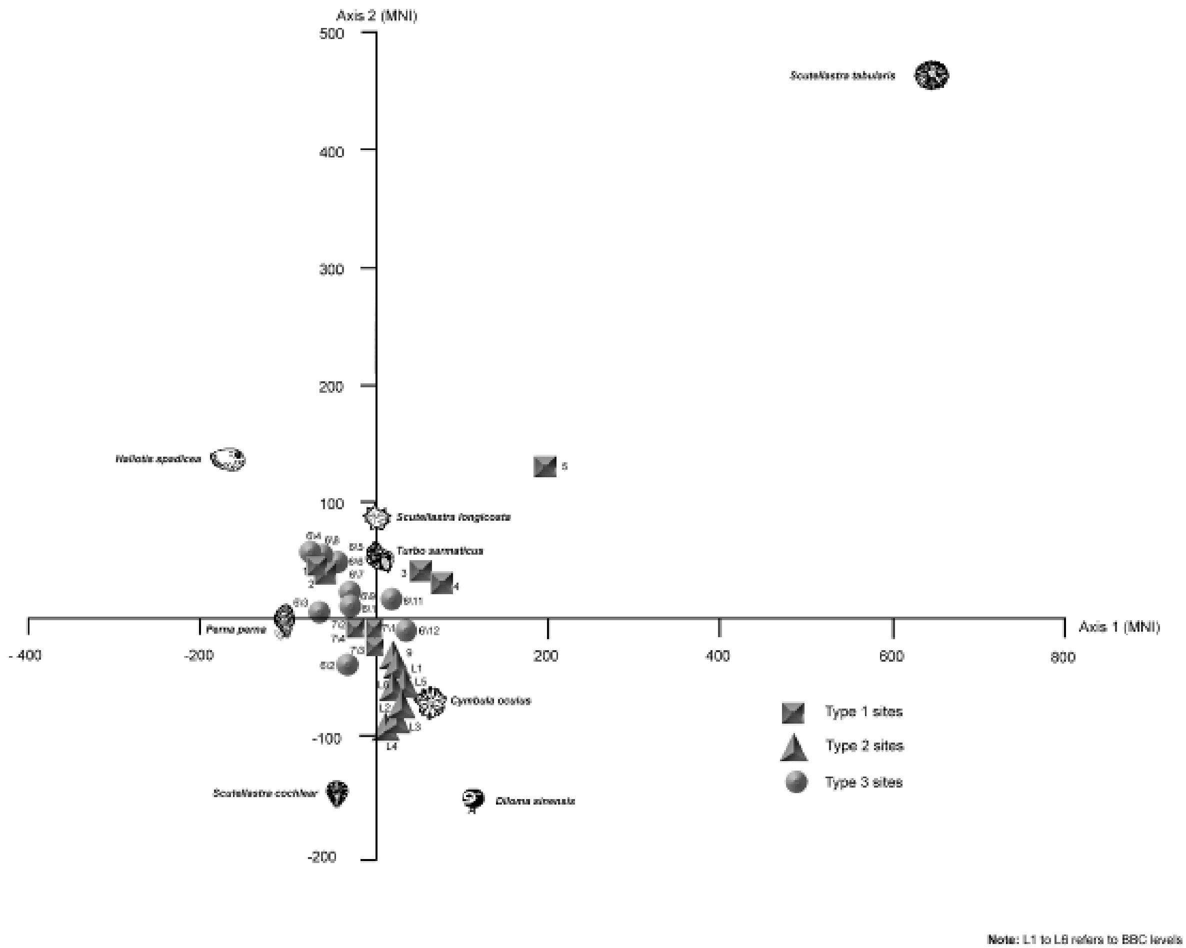


Fig.6.2: Correspondence analysis plot of BBF sites/units and shellfish species based on MNI's

Analysis of Scattergram based on MNI's (Fig 6.2 & 6.3)

A prominent feature of Figure 6.2 is the relationship between BBF 5 and *S. tabularis* which both have strongly positive values. The other major shellfish components of BBF 5 are *Turbo sarmaticus* and to a lesser extent *S. longicosta* (*cf.* Tables 6.5 & 6.6); these two species draw the BBF 5 site closer to the origin. Relatively high positive values demonstrate some relationship between BBF 5 and BBF 3 & 4; the latter two sites contain the same shellfish species as BBF 5 but in different proportions. BBF 3 & 4 lie closer to the origin than BBF 5 due to higher weightings in both *S. longicosta* and *Diloma sp*. We are thus able to say from Figure 6.2 that BBF 5 is unlike any other

BBF site, but that there is a weak grouping between BBF 5 and BBF 3 and 4. The latter two sites group strongly and are therefore very similar.

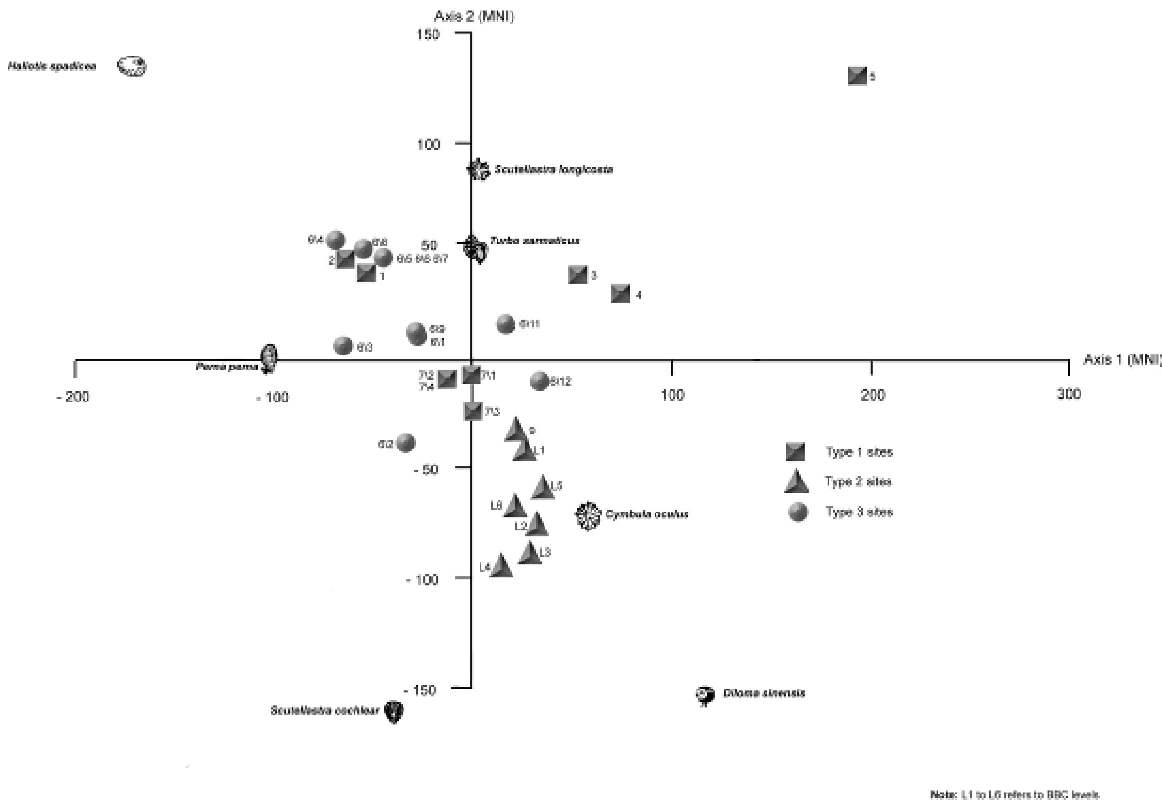


Fig. 6.3. Correspondence analysis plot of BBF sites/units and shellfish species base on MNI's (S. tabularis plot excluded)

Due to the high positive values assigned to *S. tabularis,* the large scale of the scattergram in Figure 6.2 has caused the other data points to visually group close to the origin. To rectify this, and in order to examine the shellfish and site/unit patterning more clearly based on MNI's, the scattergram is re-plotted in Figure 6.3 with *S. tabularis* excluded; the relative positions of the other shellfish species and sites/units remains the same, only the scale has been changed.

In Figure 6.3, BBF 3 & 4 remain relatively closely grouped on Axis 1 demonstrating their similarity. The next set of groupings with positive values on Axis 1 are the BBC units and BBF 9, demonstrating a strong correlation among near coastal sites which postdate 2000 B.P. The variation in location of the BBC units and BBF 9 site on Axis 2 are due to differences in the relative contributions at each site of *Diloma sp., C. oculus, S. cochlear, S. longicosta* and *Turbo.* BBF 6\12 has a similar value to the near coastal sites on Axis 1 but is drawn positively along Axis 2 due to the higher weighting of *S. longicosta*. BBF 6/11 contains relatively more *S. tabularis* than BBF 6/12 but less *Diloma sp*. giving it a higher positive rating on Axis 2 and drawing the site closer towards BBF 3 & 4.

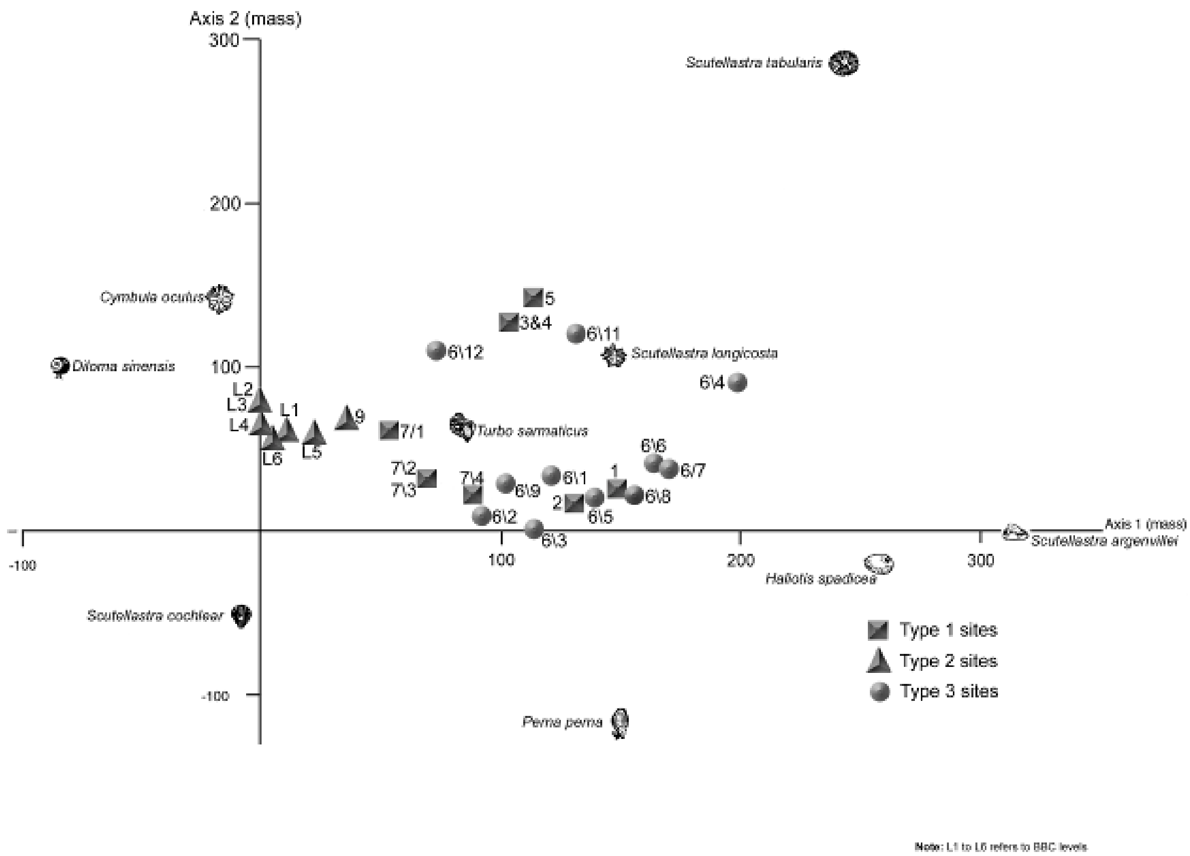


Fig. 6.4: Correspondence analysis plot of BBF sites/units and shellfish species based on mass (g).

BBF 7\1, 7\2, 7\3 & 7\4 cluster around the origin suggesting a strong grouping in one respect, that is they contain similar proportions of the same species, but in another respect it shows that these four sites are the least differentiated from all the other BBF sites. The BBF 6\1, 6\9 & 6\2 units are similarly grouped on Axis 1, the only minor difference being in the relative proportions of *S. longicosta* and *S. cochlear* causing the spatial difference between 6\2 and 6\1 and 6\9 on Axis 2. BBF 1, 2, 6\4, 6\5, 6\6, 6\7 & 6\8 form a strong group on both Axis 1 & Axis 2 containing the same species of shellfish in similar proportions. BBF 6\3 is also similar to this last group but with a higher rating for *P. perna* causing it to be drawn closer to Axis 1.

A summary of the interpretations of the scattergrams (Figures 6.2 & 6.3) shows there is considerable variation in the shellfish component of Type 1 sites, namely open, single occupation dune sites. BBF 5 is different from all the other BBF sites; BBF 3 & 4 are similar to one another; BBF 1 & 2 are grouped but dissimilar to other Type 1 sites. The only multi-occupation, Type 1, dune site, BBF 7 shows continuity in the shellfish component in all four units, BBF 7\1 -7\4, but the BBF 7 units are the least differentiated from all other BBF sites.

The Type 2 sites, BBC (all units) and BBF 9 are strongly clustered, suggesting that the shellfish component of near coastal shelter sites, which post-date 2000 B.P., are distinct and different from that of all earlier Type 1 sites located in the dune area, and to the Type 3 site, BBF 6. There are also strong associations between the BBC L1 layer and BBF 9 site, which are of a similar age; the older units, BBC L2 - L6, are also tightly correlated, suggesting that although shellfish subsistence strategies at BBF have been similar during the last 2000 years, there are some changes observable within early and later Type 2 sites/units.

Although there are similarities among some of the units from the single Type 3 site, BBF 6, (e.g. BBF 6\4-6\7; BBF 6\11 & 6\12), overall there is no coherence in the shellfish patterning across the various layers. At times therefore, BBF 6 units look similar to Type 1 sites, and to a lesser extent Type 2 sites. The result suggests there was no cohesive strategy in terms of the shellfish species targeted for collection and brought to BBF 6. One reason may be that the site is situated directly adjacent to the shell beds. If the site was used for 'snacking' or processing (see Henshilwood *et al* 1994) then it is possible that a range of shellfish in the vicinity of the site were opportunistically gathered for on-site consumption or extraction. Species which are noticeably absent at the BBF 6 site are *Diloma sp* (all layers) and *C. oculus* (Layers 6\8 - 6\1).

Some shellfish may have been processed or shucked on site for transport to occupation sites situated elsewhere, perhaps further inland. If this was the case then we would not expect *Diloma sp*. to have been processed on site due to their small size, and this might account for their absence. On the other hand *Diloma sp* may simply have been avoided; in any event their absence at BBF 6 is unlikely to have been due to environmental factors, such as changes in sea temperature, or this would also reflect on the presence/absence of other species which occupy the same habitat as *Diloma sp.*

The location of the points for shellfish categories on the scattergrams indicates which sites are most strongly affiliated to which species. As expected *Turbo* falls relatively close to the origin as it is strongly associated with all the BBF sites. BBF 5, and to a lesser extent BBF 3, 4 and 6\11 are characterised by having relatively high quantities of *S. tabularis.* The positions of *C. oculus, Diloma sp*. and *S. cochlear* show strong affinities with the post 2000 B.P. sites, BBC (all units) and BBF 9. The relative quantities of *Haliotis spadicea, Perna perna* and *S. longicosta* from BBF 1, 2 , 6/4, 6/5, 6/6, 6/7, 6/8 have caused these sites/units to be relatively loosely grouped on Axis 1, but more tightly grouped on Axis 2. All the BBF 7 layers are plotted close to the origin as they have no distinguishing features which draws them strongly in any one direction. The BBF 7 layers are thus least differentiated from the other BBF sites.

Analysis of Scattergram based on Mass (Figure 6.4)

Although the relative positions of the sites and shellfish categories plot differently on the scattergram calculated from shell mass to that based on MNI's, the overall groupings are very similar to those described in the previous section. The most obvious grouping, again, is within the post 2000 B.P. sites, BBC (all layers) and BBF 9, on both Axis 1 and Axis 2. Clearly the shellfish content of these sites distinguishes this group from the other, and earlier, BBF sites. The BBF 7 layers are also loosely correlated on Axis 1 and Axis 2, but now lie further from the origin due to the influence of a high *Turbo* mass and low *Diloma sp*. mass. (*cf*. Section 6.3). BBF 3 & 4 are plotted on the same point and show a strong affinity with BBF 5; there is still a loose grouping of these three sites with BBF 6\11 & 6\12. The balance of the BBF 6 units, with the exception of BBF 6\4, are loosely grouped on Axis 1 and Axis 2. BBF 1 & 2 group on Axis 1 with similar Axis 1 values to BBF 3, 4 & 5. However BBF 1 & 2 are less positive on Axis 2 due to the strong presence of *Perna perna* in these two sites, which are not found in BBF 3, 4 & 5, and also because of the presence of *Haliotis spadicea* in BBF 1 & 2.

Summary of Shellfish Analysis based on MNI and Mass

In summary, there is a strong correlation among all the Type 2 sites/units, BBC (all layers) and BBF 9; these sites are also distinctly different from Type 1 and Type 3 sites, suggesting a change occurred in shellfish subsistence strategies at BBF after 2000 B.P. This change appears to be a function of the length of time a site was occupied, the tidal situation at the time the shellfish were collected and/or possibly human predation pressure leading to reduced availability of some species, rather than to site location, as the species mix found in the Type 3 site, BBF 6 (all layers), also situated on the coast, is distinctly different from that of the later period near coastal sites/units. In Type 2 sites *Turbo* features less strongly than in earlier sites and *Diloma sp*. becomes the dominant shellfish component followed by *S. cochlear, C. oculus*. and *S. longicosta*. Species that are absent, or only occur in small quantities in the post 2000 B.P. sites include *Perna perna, S. argenvillei, S. tabularis* and *Haliotis spadicea*.

The Type 1 site, BBF 7 (all layers) which predates Type 2 sites (ca 3000 B.P.) is more similar in species mix and relative quantities to Type 2 sites than are the earlier Type 3 and Type 1 sites. The main differences between BBF 7 and the Type 2 sites are the presence of relatively high quantities of *Perna perna* at BBF 7 and the absence of *S. cochlear*. The latter is found in all layers at BBC &

9. This trend reinforces the observation that changes in the species composition at BBF are related to length of occupation and tidal conditions, and are not a function of site location.

The upper layers of the Type 3 site, BBF 6, namely 6\1 - 6\9, correlate more closely with one another than with BBF 6\11 & 6\12, due to the influence of *S. tabularis* in the latter two layers, again suggesting a temporal influence on species mix. *Scutellastra tabularis* is most common in sites predating ca. 3700 B.P. and occurs rarely in later sites. However, the mix of shellfish species found at BBF sites is not necessarily time related: for instance, BBF 6\11 & 6\12 (ca. 3670 B.P.) are not dissimilar to BBF 3 & 4 (ca. 5300 B.P.), despite the time differences, and BBF 1 & 2 (ca. 6400 B.P.) contain a similar composition, and weighting, of shellfish species to some of the later BBF 6 layers, especially BBF 6\5 & 6\8, which post date 4000 B.P.

The early Type 1 sites which are all open, single occupation sites situated in the elevated dune area of BBF fall into three categories: BBF 1 & 2 (ca. 6400 B.P.) are almost identical, with the exception of low weightings of *S. tabularis* at the BBF 2 site ; BBF 3 & 4 (ca. 5300 B.P.) are identical both in species mix and in relative weightings; BBF 5 is unique due to the presence of high numbers of *S. tabularis* and *Turbo.* However, BBF 5 is also different from the other Type 1 sites in a number of respects: it has a very low incidence of cultural artefacts; the central *in situ* part of the site is only a light scatter of deposit, unlike BBF 1 - 4; there are a disproportionately large number of hammerstones, anvils and broken quartzite cobbles on the site; there are no traces of a hearth area on the site; less than 1 % of the *Turbo* shells found on the site are unbroken (Table 6.7); the ratio of *Turbo* opercula to *Turbo* shells is very low (Table 6.7).

Site	% Whole Turbo shells to broken Turbo shells calculated from MNI's	No. of Turbo opercula	MNI of Turbo shells	Ratio: Opercula to Turbo shells
BBF 1	45	122	84	1.45
BBF 2	59	545	774	0.7
BBF 3	52	929	1236	0.75
BBF 4	30	907	1108	0.82
BBF 5	0.82	71	244	0.29

Table 6.7: Early Type 1 sites: Analysis of *Turbo sarmaticus* shells and opercula

Two species of shellfish were specifically targeted by the occupants at BBF 5, *Turbo sarmaticus* and *Scutellastra tabularis*. Both species have the highest flesh yields of all the shellfish exploited at BBF sites, with the exception of *Haliotis midae* and, possibly, *Haliotis spadicea*. Once cooked, either in coals or boiled, the flesh of *Turbo sarmaticus* can be shaken loose from the shell, making it unnecessary for the shell to be broken to extract the flesh. After cooking, the opercula remains loosely attached to the flesh and is easily removed, or drops off. At all the BBF sites, with the exception of BBF 5, it appears that *Turbo* were cooked on site as the majority of the shells recovered were whole, or only marginally damaged. Also the numbers of opercula generally exceed or are found in similar proportions to the number of *Turbo* shells. At the BBF 5 site less than 1% of the *Turbo* shells are whole, the rest are heavily damaged and the proportion of opercula to shells is very low. A likely explanation for these differences is that BBF 5 was a processing or extraction site and not an occupation site. It would appear that whole *Turbo* shells were broken open whilst the flesh was raw, which may also account for the large number of hammerstones, anvils and cobbles found at the site. Many of the *Scutellastra tabularis* shells are broken, suggesting that the flesh was also removed from the limpets while raw.

It seems unlikely that the flesh from these shellfish was consumed on site, and may have been transported elsewhere; the low numbers of *Turbo* opercula found at the site supports this hypothesis as the opercula would remain firmly attached to the raw flesh. Clearly the patterns of shellfish exploitation and processing at BBF 5 are different from those observed at any of the other BBF sites/units, and the evidence points to it being an extraction or processing site.

One of the questions which remains unanswered is why these relatively large and heavy shellfish were transported more than 600 metres from the sea to the dune area to be processed. We can only speculate that it may have been a rendezvous point with band members who were hunting inland, or that there were hostile groups at the coast which forced these collectors into the dune area where the shellfish could be processed at their leisure.

6.5: Shellfish Exploitation of the Intertidal zone

The third objective of the BBF shellfish analysis was to determine from the shellfish species represented at each site/unit the range of inter-tidal zones exploited, and to ascertain whether there is a relationship between site age and/or location and the inter-tidal zone exploited. Of particular interest here was whether a difference could be observed between sites which pre-dated 2000 B.P. and the arrival of the first pastoralists, and the later sites. Spatially a clear distinction could be made between the later and earlier sites: All 7 of the sites/units which post-date the arrival of herders are located in small, near-coastal shelters; all the earlier sites are located in the elevated dune area, with the exception of BBF 6, which is an exposed site on a coastal headland.

Clearly, a question that needed asking was whether there was a temporal and spatial link between shellfish subsistence strategies in the pre- and post 2000 B.P. period. Three approaches were considered: first, establish the range of shellfish found at Type 1, 2 & 3 sites and determine where each species would have been located in the intertidal zone by graphically plotting the location of each in its respective zone or zones (Figure 6.5); second, determine the range of intertidal zones exploited during the pre- and post 2000 B.P. period (i.e. compare Type 2 sites/units with Type 1 & 3 sites/units) and plot the results graphically (Figure 6.6); third, determine whether there is an increase/decrease in the size of a species over time (*cf.* Section 6.6), and particularly whether Type 2 sites/units are different in both the above respects to Type 1 and Type 3 sites/units.

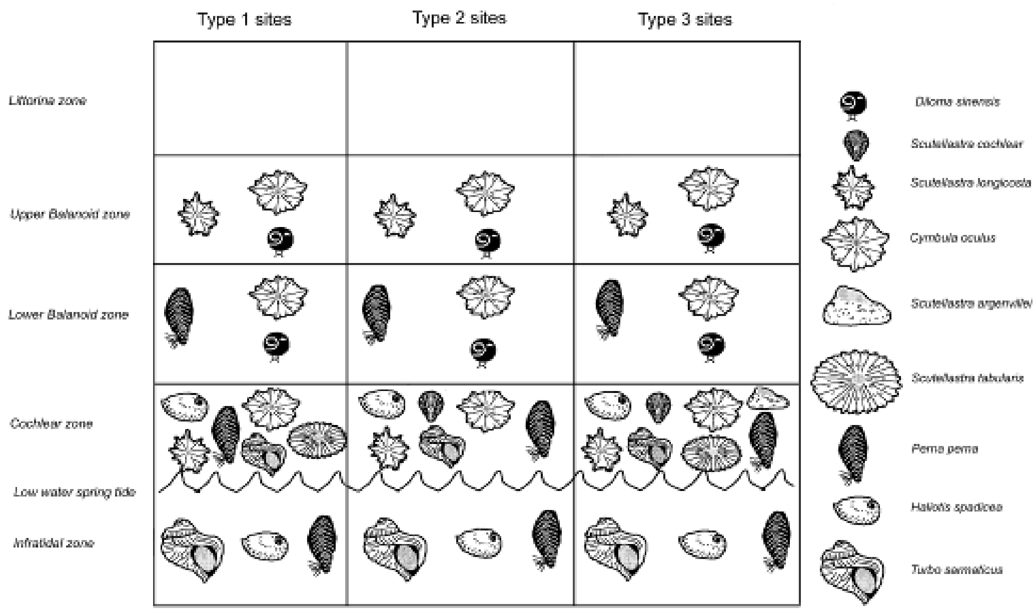


Fig. 6.5: Dominant shellfish species from BBF sites, calculated from shell mass (g) occurring in Site Types 1,2 & 3

Based on the shellfish data contained in Table 6.6, the nine dominant shellfish species found at Type 1, 2 & 3 sites units are plotted in Figure 6.5 according to the locations they occupy within the inter-tidal zone. Figure 6.5 graphically illustrates that, with the exception of *S. tabularis (*Type 1 & 2 sites only), *S. cochlear* (Type 2 & 3 sites only) and *S. argenvillei* (Type 3 sites only) the other six dominant species occur in all three site types. *S. tabularis, S. cochlear* and *S. argenvillei are* commonly found on the BBF coast today and it seems unlikely that these species were not available throughout the period that the BBF sites were occupied, although perhaps some were rarer at times due to palaeoenvironmental factors, sea levels or human predation pressures.

The method adopted to compare the range of inter-tidal zones exploited in the early and later period was to construct a table based on the relative weightings of each shellfish species for each site unit, calculated from shell mass, and to order these from most common, on the left, to least common, on the right. Sites were also ordered from oldest to youngest. The mean weighting of each species was calculated for all sites which predated 2000 B.P. and for those which post-dated 2000 B.P. (Table 6.8).

			< most common							> least common	
	R/C Date B.P.	**BBF site no.**	***Turbo sarmaticus***	***Scutellastra longicosts***	***Cymbula oculus***	***Oxystele sinensis***	***Perna perna***	***Haliotis spadicea***	***Scutellastra cochlear***	***Scutellastra tabularis***	***Scutellastra argenvillei***
Sites> 2000 B.P.											
	6560	1	5	3			4	2		1	
	6340	2	5	3	1		4	2			
	5460	3	5	4	1	2				3	
	5280	4	5	4	1	2				3	
	5120	5	5	3	2	1				4	
	3670	6\12	4	5	3	2				1	
		6\11	5	4	2			1		3	
		6\9	5	2	3		4	1			
		6\8	5	3			4	3		1	
		6\7	5	4			2	3	1		
		6\6	5	4				2	1		3
		6\5	5	4			3		1		2
		6\4	5	3			2	4	1		
		6\3	5	3			4	1	2		
		6\2	5	3			2	1	4		
		6\1	5	4				2	3		1
	2770	7\4	5	2		3	4	1			
		7\3	5	2	1	3	4				
		7\2	5	2	1	3	4				
	2710	7\1	5	3	1	4	2				
> 2, 000 B.P.	**Mean**		5	3	2	3	3	2	2	2	2
Sites < 2000 B.P.											
	1960	L6	3	2	1	5			4		
	1840	L5	5	2	1	4			3		
		L4	4	1	2	5			3		
		L3	4	1	2	5			3		
		L2	4	1	3	5			2		
	290	L1	5		3	4	1		2		
	480	9	4		3	5	1	2			
< 2000 B.P.	**Mean**		4	1	2	5	1	2	3	0	0

Table 6.8: Ranking of weighted values for BBF shellfish species by site/unit according to mass

A visual plot was constructed based on the table above whereby each species was plotted according to its weighting, where it occurs in the intertidal zone, and whether it falls in the pre- or post 2000 B.P. period. For instance, if *Turbo* had a mean score of 4 in the post 2000 B.P., then 4 depictions of a *Turbo* shell were plotted in the Cochlear zone for this period. Shellfish species were allocated to the shallowest intertidal zone in which they are likely to occur. *Turbo*, for example, are found in the Cochlear and Infratidal zones, but are only plotted in the shallower Cochlear zone.

Figure 6.6 shows that subsistence strategies after 2000 B.P. were concentrated more intensively on shellfish species situated in the shallower tidal zones. In the Upper Balanoid zone, both *Diloma sp*. and *Scutellastra cochlear* score higher values than in the >2000 B.P. period; in the later period *Perna perna* are less intensively exploited in the Lower Balanoid Zone, *S. argenvillei* are absent although more *S. cochlear* are taken; the most marked difference between the earlier and later sites is observable in the Cochlear zone. The numbers of *Turbo* decrease and *S. tabularis* are absent in the later sites. We can conclude from Figure 6.6 that during the post 2000 B.P. period BBF inhabitants utilised the upper reaches of the tidal zone more intensively; also that the species mix, and relative proportions of species taken in the later period were substantially different from that of the earlier period.

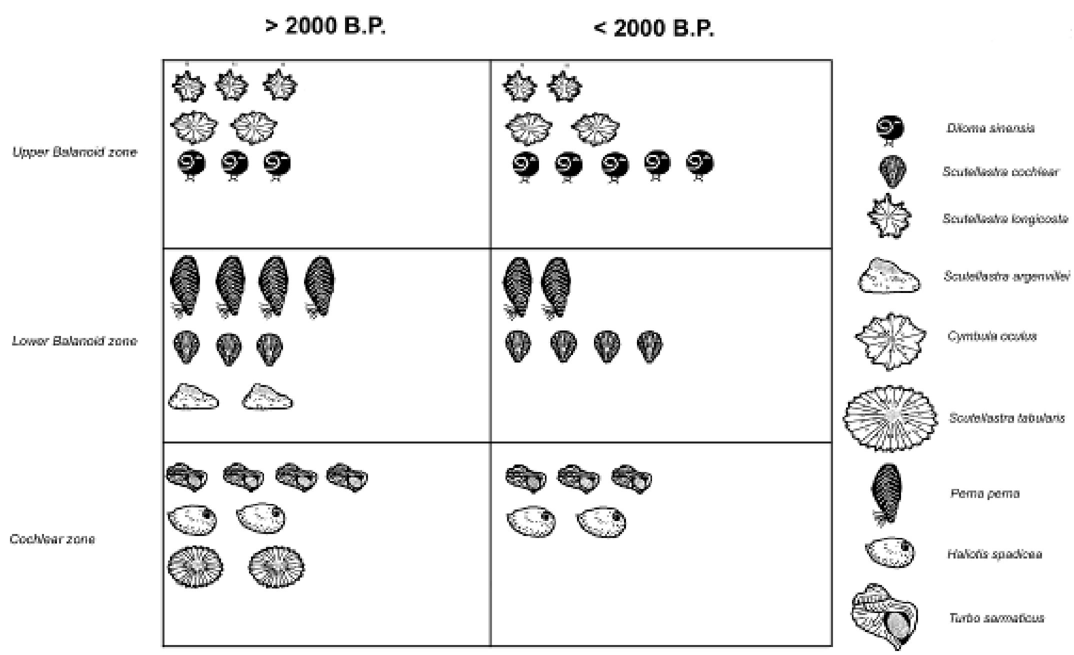


Fig. 6.6: Graphic representation of means weighted values based on MNI's for periods >2000 B.P. & < 2000 B.P. for BBF sites

6.6: Comparison of mean shellfish size by species per site/unit

The objective of this part of the BBF shellfish study was to determine whether the mean size of a species increases/decreases across sites and over time, and particularly whether shellfish decrease in size in the later Type 2 sites/units.

In order to compare changes in shellfish size, 8000 shells recovered from the BBF sites/units were measured, including 3500 *Turbo* opercula and 2500 *Patella sp.* (*cf.* Ch.5, Section 5.5). The five species which were best represented at all sites, namely *T. sarmaticus, S. longicosta, C. oculus, P. perna* and *H. spadicea* were selected for inter-site/unit size comparisons. Plots were only made for a site which had a minimum of 10 units of a species. One shellfish species is reflected per scattergram; Axis 1 represents weighted mean scores per site/unit calculated from shell mass by the DECORANA program; Axis 2 represents the mean length of a species (mm) plotted by site/unit.

Shellfish Size Comparisons

1. *Turbo sarmaticus* opercula (Figure 6.7)

The largest mean sizes of *Turbo* opercula occur in the early Type 1 sites which predate ca. 5000 B.P, namely BBF 1, 2, 3 & 4. BBF 5 opercula are not plotted as 70 % of them were broken and could not be measured. Mean opercula sizes from the other Type 1 site, BBF 7, decrease in size from the lower to upper units. The smallest mean sizes of opercula from BBF sites are found in the upper layers 7\2 and 7\1, which date to ca. 2700 B.P., and are similar in size to the BBF 9 opercula (480 B.P.). The lower units 7\3 and 7\4 are similar to the Type 2 sites/units, BBC layers L1 - L5, which cluster closely around a mean opercula length of 29 mm.

BBF 6 produced anomalous results; two units, 6\2 & 6\8 fall in a similar size class to BBF 3 & 4; BBF 6\1 and 6\3 opercula are among the smallest and similar in size to the lower BBF 7 units and BBF 9.

A summary of the results shows that overall the largest *Turbo* at BBF occur in the earlier Type 1 sites and that a decrease in the size of *Turbo* is time related and, possibly, due to human predation, the tidal conditions at the time of collection which may be linked to the length of time that a site is occupied or environmental change, not to site location or site type. BBF 1 & 2 contain the largest *Turbo* followed by BBF 3 & 4; together these four sites, which predate 5100 B.P., have the highest mean sizes of all the BBF sites. The smallest *Turbo* occur in Type 1, 2 & 3 sites which postdate 2770 B.P. If the BBF 6 site was primarily used as a processing location situated, as it is, directly adjacent to the sea, then we might expect a more random and opportunistic approach to shellfish gathering with less selection for size than appears to be the case for the earlier BBF sites where large *Turbo* were apparently being specifically targeted. This might explain the rather anomalous results from BBF 6 where there are considerable size differences in mean opercula lengths, even between adjacent units, for example between 6\1 and 6\2.

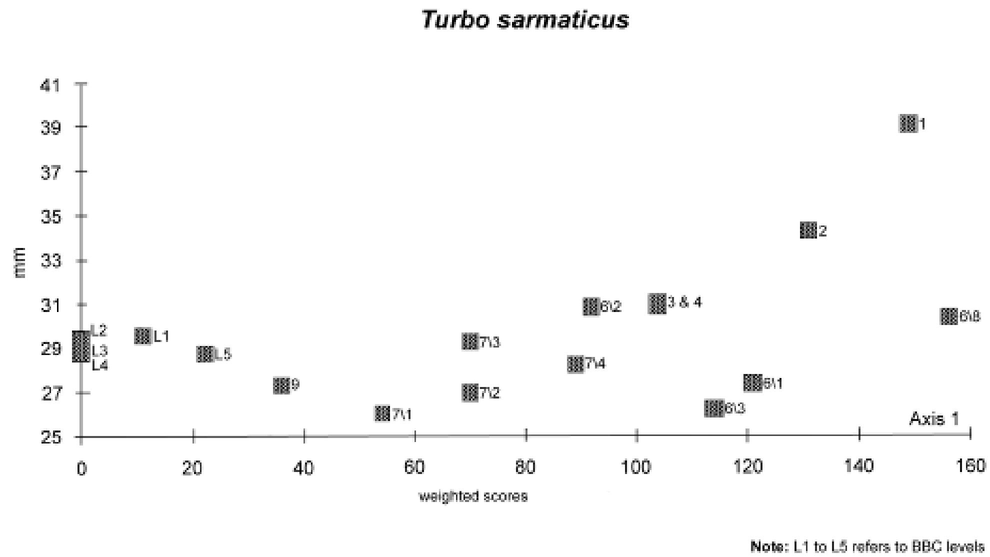


Fig. 6.7: Mean length (mm) of Turbo opercula for sites/units with MNI's 10> plotted against weighted mean species scores calculated from shell weights (Axis 1)

2. *Scutellastra longicosta* (Figure 6.8)

Mean lengths of *S. longicosta* at BBF 1, 2 & 4 exceed 64 mm. Curiously, the mean length of *S. longicosta* at the BBF 3 site (5460 B.P.) is around 60 mm, placing it in the same size category as the BBF 6 units (<3670 B.P.). BBF 6 units are combined due to the small sample size of *S. longicosta* from this site. All the BBC units are closely correlated with a mean size of between 58.5 mm and 59.5 mm. BBF 7 (all units) has the smallest mean size of *S. longicosta* at 57.5 mm.

Overall, the trend for *S. longicosta* sizes is similar to that of *Turbo* where the largest mean shell lengths occur in the early Type 1 sites. BBC (all units) shells are tightly clustered with regards to shell length and are substantially smaller than those of the early Type 1 sites. BBF 7 has the smallest mean sizes of *S. longicosta* and follows the same pattern observed for *Turbo*. BBF 6 shells are marginally larger than the BBC units, but considerably smaller than the early Type 1 sites.

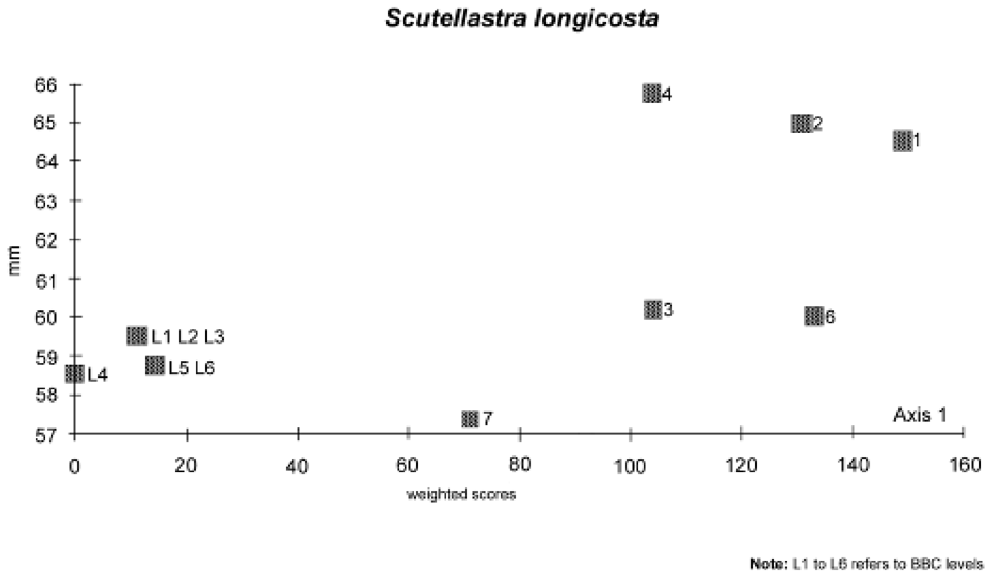


Fig. 6.8: Mean lengths (mm) of Scutellastra longicosta for sites/units with MNI's <10 plotted against weighted mean species scores calculated from shell weights

3. *Cymbula oculus* (Figure 6.9)

Cymbula oculus shells from BBF 4 (mean 71 mm) are, on average, substantially larger than those from BBF 3 (mean 66 mm) and BBF 2 (mean 64 mm). Despite these inter-site differences, the mean shell sizes from early Type 1 sites are the largest for all the BBF sites. The BBC units are again tightly correlated with regard to the average size of *C. oculus* at around 61 mm; BBF 9 shells are slightly smaller averaging 60 mm. At BBF 6 & 7, *C. oculus* are marginally larger than at BBC with a mean of 61.5 mm.

Cymbula oculus are, on average, larger in the early Type 1 sites, BBF 2, 3 & 4. *C. oculus* are common in the lower three layers at BBF 6, but virtually absent from the upper nine layers. If this absence in the upper layers is due to heavy predation of this species in the earlier layers we would expect an overall relatively smaller mean for *C. oculus* at BBF 6. Similar mean sizes (60 - 62 mm) are recorded for the BBC units and BBF 7 & 9 which post-date 2770 B.P.

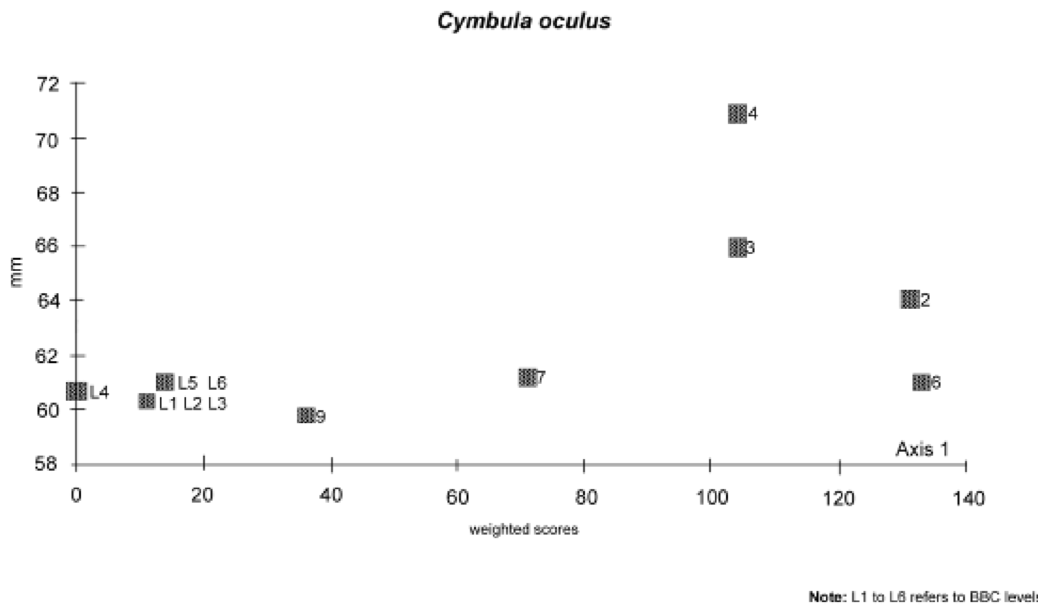


Fig. 6.9: Mean lengths (mm) of Perna perna for sites/units with MNI's >10 plotted against weighted mean species scores calculated from shell weights (g)

4. *Perna perna* (Figure 6.10)

In contrast to the trend observed for the three shellfish species described above, the largest mean lengths for *Perna perna* are from the BBC site (69 mm), BBF 6 (62 mm) and BBF 9 (57 mm). The smallest mussels, on average, are from BBF 2 & 7. The explanation for this trend reversal may lie in the pressure placed on mussel stocks at various times during the BBF occupations or due to environmental change. During the period of occupation at the BBF 2 site it appears that mussels were being heavily exploited; a similar situation occurs at BBF 7. At the BBF 6 site mussels are present in some layers but absent from others; a similar situation occurs at BBC with only one layer, BBC L4 containing a reasonable number (MNI 65).

A summary of the results suggests that the sites with the smallest mean sizes of *P. perna* are those which contain the greatest relative quantities of mussels and vice versa. One possible explanation for this patterning is that during periods of high predation on mussel stocks the average size of the mussels available for collection decreases although other factors, such as environmental change or simply that smaller mussels were gathered from the upper reaches of the intertidal zone. Mean mussel size is related to their location in the intertidal zone; those found in deeper water, especially the Infratidal zone, are generally larger than those growing in shallower water. However, this may not be the explanation for the differences in mean mussel size at BBF sites. As was shown in Figure 6.6, shellfish were harvested more intensively in the lower inter-tidal zones during the earlier occupations at BBF, and not in the post 2000 B.P. period. Therefore, we should expect that, on average, the larger mussels would be found in the earlier sites. As this is not the case, the effects of higher predation rates or environmental change seems a more likely explanation for decreasing mussel size in the earlier sites. In order to confirm that high predation rates were responsible for a decrease in mussel size we would need considerably more sites which date to the same period to get a better idea of the likely pressures placed on marine stocks at a particular time.

Interestingly, the smallest mussels, on average, come from the BBF 7 site (all layers) providing further confirmation of the overall small size of shellfish from this site.

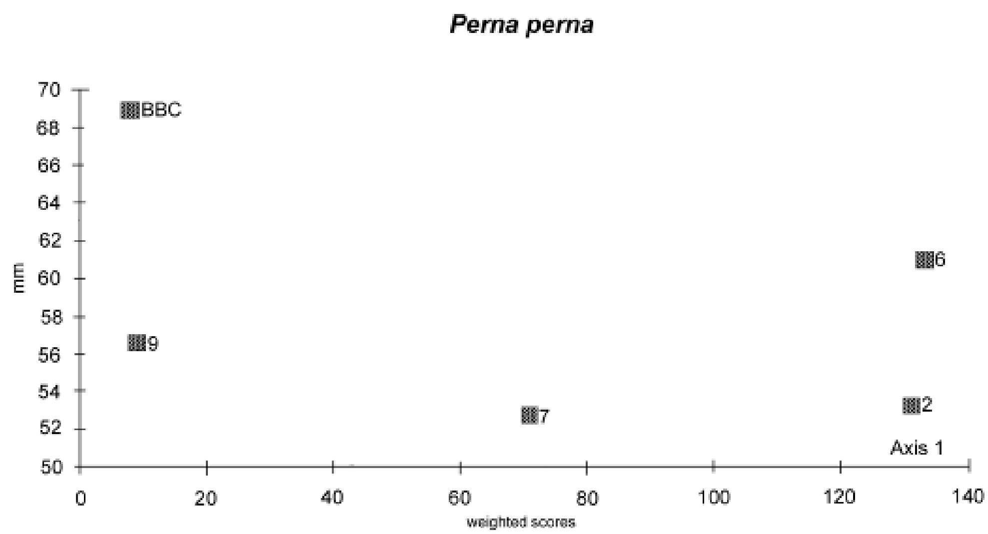


Fig. 6.10: Mean lengths (mm) of Perna perna for sites/units with MNI's >10 plotted against weighted mean species scores calculated from shell weights (g)

5. *Haliotis spadicea* (Figure 6.11)

As is the case for *P. perna*, noted above, the largest mean sizes of *H. spadicea* are found in the later Type 2 sites, BBC & BBF 9. The early Type 1 sites, BBF 2 and, in particular, BBF 3 reflect smaller means. BBF 6 size distributions are somewhat ambivalent and fall between Type 1 early sites and Type 2 sites. The smallest mean sizes of *H. spadicea* are again found in the BBF 7 site, reflecting a similar pattern observed for *P. perna, S. longicosta, C. oculus* and *Turbo* at this site. The relative numbers of *H. spadicea* are highest in the early sites, BBF 2 & 3, but this species is only sporadically represented in the BBF 6 & 8 units. This patterning suggests that in the later sites *H. spadicea* was not consistently targeted for collection although at times, for instance in the BBC L4 unit and at BBF 9, *H. spadicea* do occur in reasonable numbers.

Changes in the mean sizes of *H. spadicea* may, in part, be linked to patterns of predation; at sites where this species is consistently targeted their mean size decreases, for example at BBF 2, 3 and 7 (all units). If they occur only sporadically within the various units at a single site, as is the case in the BBF 6 and 8 units the mean size of *H. spadicea* is larger. The large mean size of *H. spadicea* at BBF 9 suggests that during the period this site was occupied *H. spadicea* were commonly available, and that, possibly, larger animals were being deliberately selected. Other factors which may account for the changes in the mean sizes of *H. spadicea* are environmental factors or the level of the intertidal zone from which they were collected - generally the larger specimens are found in the lower reaches of the intertidal zone.

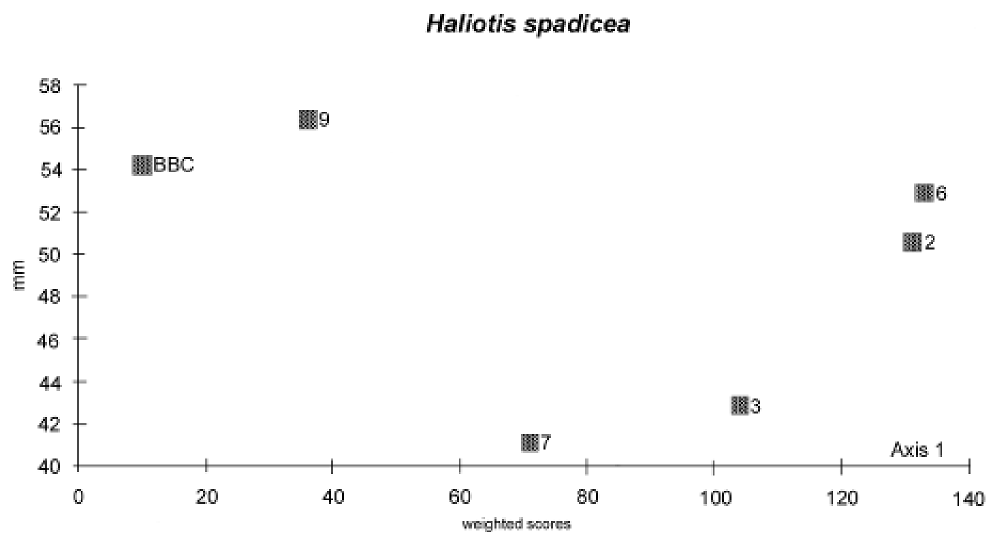


Fig. 6.11: Mean lengths (mm) of Haliotis spadicea for sites/units with MNI's >10 plotted against weighted mean species scores calculated from shell weights

Summary of Results: Mean shellfish size at BBF sites

Turbo sarmaticus is the most common shellfish species (both for mass and MNI's) and was consistently targeted by the inhabitants at all the BBF sites. Changes in mean *Turbo* sizes appear to be time related, that is they are larger, on average, in the early sites and vice versa. One of the major difficulties in attempting to make inter-site comparisons is the small number of sites excavated relative to the time period involved; we have evidence of only 28 sites/units which were occupied sporadically over a 6000 year period. In some cases over 1000 years may separate two sites, for example BBF 5 and BBF 6\12. As a result we are not able to accurately gauge the pressures placed on marine resources in the interim periods, or indeed that BBF was even occupied during these interims. A great deal more sites would need to be excavated in the BBF area if we are to begin to understand the finer details of marine subsistence strategies over the 6000 year period.

Scutellastra longicosta are the most common limpet found in all the BBF sites/units, particularly during the period prior to 2770 B.P. There is a noticeable decrease in the numbers and mean size of *S. longicosta* in the units which post date 2770 B.P. It is difficult to assess from the BBF data what factors were responsible for the apparent lack of interest in this species of limpet in the later time period. Either size or availability, or both may have been responsible; it may not have been considered economic to harvest *S. longicosta* if the mean size or numbers of this species were relatively small. Unfortunately, we are not able to accurately gauge from the archaeological data whether this was the case. However, we can observe a distinct switch from *S. longicosta* to *C. oculus* and *S. cochlear* in the units which post-date 1840 B.P. The mean size of *C. oculus* in the Type 2 sites is only marginally larger than that of *S. longicosta,* suggesting that increased harvesting of *C. oculus* and *S. cochlear* in the post 2000 B.P. period was motivated by species availability, or idiosyncratic choice, rather than mean size.

Both *P. perna* and *H. spadicea* were harvested consistently during the pre- 2770 B.P. period at most sites which may account for the relatively small mean size of these species in the earlier period. At the BBF 7 site, *P. perna* are the second most common shellfish species and were harvested in large numbers. *H. spadicea* and *P. perna* only occur in very small numbers in the post 2000 B.P. period and appear to have been targeted only during the occupation of the BBC L4 unit and at BBF 9. However, even in the latter two sites both species feature relatively low down on the list of preferred shellfish. The relatively large mean sizes of *H. spadicea* and *P. perna* from Type 2 sites appears to be a function of low predation on these species in the post- 2000 B.P. period.

The overall conclusion that can be drawn from the shellfish size data presented above is that the age of a site, its location, or type (i.e. single occupation or multiple occupation) do not appear to have had a significant influence on the mean size of shellfish collected. The reasons for the increase or decrease in the sizes of various shellfish species collected may be related to human predation patterns but could also be due to environmental factors, the length of time a site was occupied, tidal conditions or to size selection procedures adopted by inhabitants of the various sites.

6.7: Palaeoenvironmental Factors and Predation Pressure

We cannot look at the results from the above data in isolation but need also consider a number of other factors which may have influenced the shellfish subsistence strategies of the BBF inhabitants. The final objective of the BBF shellfish analysis was to compare the range of shellfish species exploited at all BBF sites to those likely to have been available for exploitation on the BBF coastline, taking into account seasonal availability and palaeoenvironmental factors such as rising and falling sea levels, sea temperature changes and changes in the morphology of the coastline. Some of the answers are provided in Sections 6.5 & 6.6 above; further consideration is given to some of the points below.

Palaeoenvironmental Factors

Figure 6.5 (i.e. Type 1, 2, 3 sites zone comparison) shows that the same species of shellfish were available during the periods that the BBF sites were occupied, although we are unable to estimate their availability in the interim periods between occupations. Sea level changes during the Holocene may have had little, or no effect, on species availability. In part, this may be due to the topography of the coastline in the vicinity of BBF. An increase or decrease of 2-3 m in sea levels would only marginally have affected the inter-tidal zones which provided suitable conditions for the establishment of a range of shellfish at BBF. TMS outcrops extensively over a wide range of elevations on this part of the coast forming natural rocky bays and inlets and these would have been relatively unaffected by minor changes in sea level.

This may not have been the case at Blombos Beach situated to the west of BBF. A marginal rise of 1-2 m in sea levels would substantially affect the expanse of exposed level beach causing changes in sand distribution patterns and also erosion of the dunes situated at the rear of the present beach. The habitat of the white mussel, *Donax serra*, is restricted to beaches which are evenly planed and this species is particularly vulnerable during periods when beach sand is being heavily eroded. *Donax serra* is only found in the early BBF sites 1, 2, 3 & 4 and in some of the BBC units. Between 5280 B.P. and 1840 B.P. *Donax serra* may not have been available for collection at Blombos Beach due to the high sea levels postulated for the Mid- and Later Holocene periods (*cf.* Ch. 2).

However, other factors may also be responsible for the absence of this species from BBF sites during this time period. For example, changes in the slope of the beach shelf may not have provided favourable conditions for the establishment of white mussel colonies or *Donax serra* may have been avoided by choice, perhaps for cultural reason or because the effort involved in locating and excavating the mussels outweighed the returns. *Donax serra* are not currently found at Blombos Beach. and possibly the beach is, and has always been, only marginally suitable as a habitat for this species.

Patella granularis is found along almost the entire South African coast and is unaffected by ocean temperatures (Tietz & Robinson 1974; Branch *et al* 1999). This species of limpet is only found in two units at the BBF site, and then in very small quantities. It seems unlikely that its almost complete absence at BBF sites can be attributed to environmental factors or to the shellfish sampling strategies adopted. A more likely explanation is the relatively small size of this species (maximum length 30 mm); it may have been considered uneconomic to gather a limpet of this size, given that a wide range of larger limpets were also easily available (*cf.* Schweitzer & Wilson 1982:114). *Chiton* are found in small quantities throughout most of the period that the BBF sites were occupied, indicating that this species was available for collection for most of the Holocene. Once cooked, the individual components of a chiton shell are separated, and being relatively fragile are easily broken. In part, this may account for the low numbers of chitons found at BBF sites; however, it may be that chitons were simply not a highly sought after shellfish, although they may have been gathered opportunistically and on a sporadic basis.

Changes in mean sea temperatures may have had an effect on the growth rates of some species, for example *Turbo* (Yssel 1989). Individual species of shellfish have an optimal range of temperatures for maximum growth (Branch pers. comm.); if water temperatures increase or decrease below a tolerable level an animal may respond by growing more slowly or a species may disappear from an area altogether. Several species of *Patella* may decrease in size as the mean sea temperature increases, for example *S. longicosta.* (Branch 1974). Based on the mean sizes of *S. longicosta* recovered from layers 8 - 3 at Byneskranskop 1 site, which span a 2500 year period, Schweitzer & Wilson (1982:115) suggest that, at times, a marginal decrease in shell lengths may be attributable to increasing sea temperatures and not human predation. However, for a large part of this period the minimum lengths of the *S. longicosta* population increase and the maximum lengths remain constant, suggesting that the overall effect of sea temperature changes on this species may have been marginal.

At Nelson Bay Cave the brown, warm water mussel, *Perna perna* replaced the black mussel, *Choromytilus meridionalis* after 8000 B.P. in response to increasing sea temperatures (Klein 1973). A wider range of molluscs from the whole intertidal zone is represented during the Mid-Holocene period at Nelson Bay Cave (NBC) including *Patella sp., Haliotis sp., Turbo sarmaticus, Diloma sp., Donax serra* and *Burnupena* than in the Early Holocene (Klein 1973; Inskeep 1987). Klein

(1973) suggests that the increase in the range of shellfish exploited in the Mid- and Later Holocene at NBC is due to greater efficiency at cropping marine resources, or simply not minding getting wet, and not to environmental changes. A further factor is the closer proximity of the rocky coast to NBC during this time period.

The shellfish evidence from BBF sites suggests that during the last 6,000 years minor changes in mean sea temperatures did not substantially affect the range of shellfish species available (*cf.* Figure 6.5), although the mean size of some species of shellfish may have been affected. This last factor is not measurable, both because we have insufficient knowledge of the precise changes in sea temperatures during the Holocene at the Cape, but also of the specific effects of sea temperature change on the rate of growth of the shellfish species found at BBF.

Predation Pressure

Heavy predation during the last thirty years on a number of shellfish species found on the Cape shores has impacted both on species availability and size. In particular, *Haliotis midae* are virtually extinct in some areas, and the mean size of adults in most areas has been greatly reduced (Griffiths pers. comm.). A reduction in the range of shellfish species and in the size of shellfish are recorded in the Transkei, Eastern Cape Province, due to heavy predation by local inhabitants in recent years (Bigalke 1973; Hockey *et al* 1988; Lasiak & Dye 1989; Tregoning & van der Elst n.d.); similar results due to overpredation of molluscs are reported from Papua New Guinea (Poiner & Catterall 1988), Washington State (Dethier *et al* 1989) and Tonga (Spenneman 1986). At the Dunefield Midden site, situated on the western Cape coast, Parkington *et al* (1992) have demonstrated that even during the course of a single occupation changes are observable both in the choice of shellfish species harvested and their mean size. During the early stages of occupation at the Dunefield Midden site the larger animals, and larger shellfish species, are preferred, but during the latter stages of occupation the smaller shellfish species and smaller animals are also gathered.

Unfortunately, we are unable to ascertain the human demographic changes which occurred in the BBF area during the Holocene from the limited site evidence that we have available and also because of the long time periods between some of the occupation units. However, archaeological evidence gathered from a number of other sites in the Cape region points to increasing population pressures during the Late Holocene, in particular after the arrival of pastoralists. For example, the number of sites situated in small shelters in the inland Cape Folded Mountains increases considerably in this later period (Hall 1986; Parkington 1987; Parkington *et al* 1988). As the coastal plains were favoured for grazing Khoe stock (*cf.* Hall 1986; Smith 1986; Sadr *et al* 2003), San visits to the coast may have become less frequent, or timed so as not to coincide with Khoe rounds. Related to this may be a greater use of small coastal caves and a reduction in the extent of open coastal sites. Within the BBF area, open sites all predate the arrival of herders, and coastal caves and shelters are only occupied in the post 2000 B.P. period.

Increasing pressure on marine resources during the later occupations at BBF may have contributed to a reduction in the mean sizes of some shellfish species, for example *Turbo, C. oculus* and *S. longicosta* but as this is not the case for *P. perna* and *H. midae* it is not possible to generalise on the causes and effects of changes in shellfish size or species availability.

Based on the evidence available from the BBF sites, it is more prudent to conclude that during periods of heavy predation by humans on a particular species the mean size of animals collected decreases. Conversely, if a species is left relatively undisturbed for a period of time, perhaps only for short periods of 10 -20 years, the overall population of a species will increase and the proportion of older and larger animals will correspondingly expand resulting in an increase in the mean size of the animals available for collection (Branch pers. comm.).

6.8: Comparison of BBF shellfish patterns with other southern Cape sites

If direct comparisons could be made between shellfish exploitation patterns at BBF with those from excavated sites situated elsewhere on the southern Cape coast we would be in a better position to examine and compare the broad trajectory of shellfish exploitation within the region. However, there are a number of problems which complicate these kinds of comparisons. Within a 200 km radius of BBF only a handful of coastal sites have been excavated; at two of these sites, excavated in the 1930s, the shellfish component is ignored in the site reports, i.e. Oakhurst (Goodwin 1933, 1938) and Matjes River (Dreyer 1934). Goodwin (1946) mentions the presence of large middens at Slang River, near Humansdorp containing *P. perna, Diloma sp*. and *D. serra*, and at the Gouritz River mouth where piles of shells appeared to be sorted into species, mainly *H. spadicea* and *P. perna* - however no further information is provided or an attempt made at quantification. At the Tsitsikama National Park sites a small sample of shellfish were analysed from two coastal cave sites but no radiocarbon dates are given (Deacon, H.J. 1970).

Further afield, excavations at Cape St. Francis (Cairns 1975) in the eastern Cape produced a shellfish sample too small to allow a meaningful comparison with the BBF shellfish. Van Noten's (1974) excavation at the Gordon's Bay shell midden in the south-western Cape lists details of the shellfish from the L3 layer only, dated at 3220 B.P., but the author states that the list was compiled from a random sample taken from the unit. A comparison of the four most common species from the L3 layer, namely *Diloma sp., S. longicosta, C. oculus, Turbo* and *Burnupena cincta* shows some similarity to the most common species found at the BBF 7 site (2770 B.P.). Limited excavations were carried out at coastal middens located in the Pearly Beach (PB) area in the south-western Cape by G. Avery (1974). He notes that extensive scatters of marine shell had been exposed by recent dune movement in the area and obtained a date of 1680 B.P. from one of the middens. Similar species to those found at the BBF sites are recorded at the PB1 - PB 6 and SFT1 middens, including *H. spadicea, Diloma sp., Turbo,* a range of *Patella sp*.and a few *D.serra*. *Haliotis midae* and *Choromytilus meridionalis,* a cold water mussel, are common at the PB sites. The presence of black mussels at the PB sites emphasises the difference in marine environments, in particular with regard to sea temperature, between the BBF area and the south-western Cape coast. Lower mean sea temperatures which occur in the vicinity of south-western Cape sites, for example at Die Kelders, Byneskranskop 1 and Pearly Beach, influence the range of shellfish species found in the inter-tidal zones in this area. *Turbo* are rarer in the western sector of the southern Cape coast (Tietz & Robinson 1974); *H. midae* are more common in the colder waters of the south-western Cape, for instance at Hermanus, than they are further eastwards towards Still Bay (Griffiths pers. comm.). Changes in the distribution and mix of the range of shellfish species along the Cape coast due to palaeoenvironmental factors highlights the problems of comparing marine subsistence strategies adopted by prehistoric people in different areas, and at different times. It also emphasises the need to concentrate on increasing the numbers of sites excavated within a circumscribed area of the coast. By adopting this approach we are likely to gain a greater understanding of the variations in Holocene shellfish subsistence strategies within a particular region, rather than by comparing sites situated often hundreds of kilometres apart.

The closest well excavated site to BBF is Nelson Bay Cave, situated approximately 200 km to the north-east, with coastal conditions similar to those in the BBF area. Shellfish from Nelson Bay Cave (NBC) were sampled from some of the later excavated units, but bulk samples taken from earlier excavations have not been analysed (*cf.* Inskeep 1987:213). As there is no detailed analysis of shellfish by unit from NBC it makes comparison with the BBF sites/units difficult. A divison has been made between the upper and lower units, the oldest date for the upper Unit 63 is 3600 B.P.; the oldest unit in the lower levels is dated at 5890 B.P. *Patella* and *Perna* are major contributors to the shellfish in all layers. *C. oculus* are more common in the lower layers with a marginal increase in *S. argenvillei* in the lower units. The major groups of shellfish found at the BBF sites, namely *Turbo* and *Diloma* occur in small quantities at NBC suggesting a distinct difference in shellfish strategies at NBC and BBF. Unfortunately it is not possible to quantify these differences more specifically, especially in the pre- and post 2000 B.P. periods, due to the limited data set from the NBC site.

The most comprehensive analyses of shellfish from sites situated on the south-western Cape coast are from Byneskranskop 1 (Schweitzer & Wilson 1982) and Die Kelders (Schweitzer 1979). At the latter site the author emphasises that the sampling strategies employed for shellfish collection during excavation varied among the various layers, although he considers the methods employed were adequate for statistical analysis.

The LSA layers at Die Kelders post-date 2000 B.P. *Choromytilus* and *Perna* are the most commonly occurring genera at Die Kelders and account for 67 % of the total shell sample. *Burnupena* accounts for 17 % of the sample from all layers; *Bullia* and *Chiton* are infrequent. *Patella* species include *P. granatina* (most common) followed by *P. granularis*, but in most units *Patella sp*. account for less than 10 % of the total marine shell component. *Turbo* was recovered from most units but in relatively small quantities. Schweitzer concludes from the Die Kelders data that two species were being consistently and primarily targeted by the inhabitants at the site, namely *Choromytilus* and *Perna.*

The largest variety of shellfish are found in the earliest layers, ca. 1960 B.P. and the shells are, on average, of a larger size; the period of occupation during this time was also relatively short. He suggests that there is a reduction in both the diversity and richness of the shellfish fauna over time - in the upper layers there is evidence of increasing reliance on other foods, in particular domestic animals, but that the time spent at the coast was more protracted than in the earlier occupations (Schweitzer 1979:194).

Clearly there are distinct differences in the shellfish strategies adopted by the Die Kelders inhabitants from those followed by the occupants of the BBF sites which post-date 2000 B.P. The most apparent reason for the differences relates to species availability. *Choromytilus* and *Perna* were available in abundance in the early occupation layers at Die Kelders and were consequently heavily exploited; over time the mean size of both species decreases, possibly due to heavy predation pressures, and by 1500 B.P. there is a change in the shellfish species mix, and less reliance on marine shells.

At the BBC & BBF 9 sites this is not the case and shellfish continue to be heavily exploited until, at least, 500 B.P. One reason for this may relate to differences in the population demographics of the two areas; the BBF shellfish stocks may have been relatively less exploited after 2000 B.P. compared to the shellfish at Die Kelders thereby ensuring a continuing and sustainable shellfish population in the BBF area.

The relative richness of marine fauna available in the two areas during this period is difficult to ascertain, as a rule species diversity increases in an easterly direction along the southern Cape coast, although not necessarily the total mass available for human exploitation. The BBF coastline may have been able to sustain higher rates of predation than was the case at Die Kelders, particularly if a wider range of marine fauna were available for exploitation at BBF, and as a consequence there was less pressure on a limited number of species. However, the mean decrease in the size of *Choromytilus* and *P. perna* at Die Kelders, which may be due to heavy human predation, is similar to the pattern observed for most shellfish species at the BBF sites.

If a genera is consistently and heavily targeted, possibly even during the course of a single occupation at a site (*cf.* Parkington *et al* 1992), the mean size of the animals is likely to decrease over time. At some stage during the course of a single occupation it may not be considered economic to continue harvesting the same species and this could precipitate a switch to the collection of another species, or a different suite of shellfish (*cf.* Parkington *et al* 1992). A possible example of this is the substitution of *C. oculus,* common in the lower BBF 6\9 - 6\12 layers, with *S. cochlear* which becomes increasingly common in the layers above BBF 6\7, but is absent in the lower layers.

Byneskranskop 1 (BNK 1) is situated approximately 10 km to the south-east of Die Kelders. Layer 9 is dated at ca. 6000 B.P. and the top layer at 255 B.P. As is the case at BBF, *Turbo* is the most commonly represented shellfish at BNK 1, accounts for 32 % of the site total, and is dominant in the upper layers post-dating 3000 B.P. and in the early layers ca. 6000 B.P. In the middle layers, ca. 3900 B.P., *Diloma sp.* increase in relative numbers and are common in the upper and later units. *Patella* species are more frequent before 3900 B.P. at BNK 1 and consistently decrease in numbers over time. Layers 1 & 9 at BNK 1 have the lowest frequencies of *Patella*, but also have the largest mean sizes and range of *Patella* species. Because of the time differences between the various layers at BNK 1, Schweitzer & Wilson (1982: 116) are cautious in associating changes in the mean lengths of shellfish species to the effects of sea temperature changes or human predation.

6.9: Summary

A wide range of marine fauna are found on the rocky portions of the southern Cape coast. From the shells excavated at the BBF sites we have evidence that a wide range of shellfish were exploited over a 6000 year period; some of the shellfish were brought to the sites to be eaten, others were introduced incidentally, perhaps by being attached to host shells.

All the shellfish recovered from the BBF sites were identified to species, where possible; MNI's were calculated and the mass of each species per site/unit recorded; whole shells were measured. Fifteen species of shellfish regarded as 'food' were exploited by the BBF prehistoric inhabitants. Two species are found within all the sites/units excavated, namely *Turbo* and *Diloma*; other shellfish commonly gathered include *Haliotis spadicea* , *Perna* and *Patella sp.* The rarest species are *Chitons, Donax, Haliotis midae* and *P. granularis*.

In order to make fair inter-site/unit comparisons of the shellfish found at all the BBF sites/units, the five most common species at each site were allocated a weighting of between 1 - 5, the higher number being allocated to the most common species. This ranking procedure was applied to tables calculated both from mass and MNI's; the results were converted by the DECORANA correspondence analysis program and plotted graphically on scattergrams reflecting the relative positions of the 27 BBF sites/units and, respectively, 8 categories of shellfish based on MNI's, and 9 based on mass.

In summary, the correspondence analysis results show a strong correlation among all the Type 2 sites, namely BBC (all units) and BBF 9. In comparison to Type 1 and Type 3 sites, which predate 2000 B.P., both the shellfish mix and relative species weightings are distinctly different in Type 2 sites, suggesting a change occurred in shellfish subsistence strategies at BBF after 2000 B.P. In Type 2 sites, *Turbo* features less strongly than is the case for the earlier sites and *Diloma* becomes the dominant shellfish component, followed by *S. cochlear, C. oculus* and *S. longicosta;* species that are absent, or only occur in small quantities in Type 2 sites include *Perna, S. argenvillei, S. tabularis* and *H. spadicea*. It is possible that longer periods of site occupation, tidal conditions at the time of collection and/or higher rates of human predation on shellfish in the BBF area after 2000 B.P. were responsible for the observed changes rather than site location. Both Type 2 and Type 3 sites are situated on the coast, yet the species mix in the earlier Type 3 site is distinctly different from that recovered from the later Type 2 sites. Within the Type 3 site, the species mix in the upper layers, 6\1 - 6\9 correlate fairly strongly and are different, on average, to the shellfish found in the lower layers, 6\11 and 6\12, suggesting that shellfish changes at this site are time related. BBF 7 (ca. 2700 B.P.), which is situated in the elevated dune area at BBF and immediately predates the Type 2 sites, is more similar in both species mix and in the relative quantities of each species to Type 2 sites than it is to the earlier Type 1 sites situated in the dune area, or to the Type 3 site.

The early Type 1 dune sites can be separated into three categories based on species composition: BBF 1 & 2 (ca. 6400 B.P.) are almost identical; BBF 3 & 4 (ca. 5300 B.P.) are identical both in species mix and relative weightings; BBF 5 is unique due to the presence of high numbers of *S. tabularis* and *Turbo*. Based on the overall assemblage excavated at this site it appears that BBF 5 was a location for processing shellfish.

The third objective of the BBF shellfish study was to determine the range of inter-tidal zones exploited by its prehistoric inhabitants, and in particular whether a difference could be observed between sites which pre-dated 2000 B.P. and the arrival of the first pastoralists at BBF (*cf.* Ch. 5 & 7), and the later sites. From the range of shellfish found at Type 1, 2 & 3 sites the location of each species in the intertidal zone was graphically plotted (Fig. 6.5). A graphic comparison was then made between the range of intertidal zones exploited during the pre- and post 2000 B.P. periods (Fig. 6.6). The results show that subsistence strategies after 2000 B.P. were concentrated more intensively on shellfish species situated in the shallower tidal zones. The most marked difference between the earlier and later sites is in the Cochlear zone; after 2000 B.P. *Turbo* are less heavily exploited and *S. tabularis* is absent.

Five species of shellfish, *T. sarmaticus, S. longicosta, C. oculus, Perna* and *H. spadicea,* are best represented at all the BBF sites, and were consequently selected for a study comparing mean shellfish sizes. Over 8000 shells were measured including 3500 *Turbo opercula* and 2500 *Patella* species. Scattergrams for each species reflect weighted mean scores per site/unit calculated from shell mass on Axis 1 and the mean length of a species plotted by site/unit on Axis 2. Three species decrease in size in relation to time. The largest mean sizes of *Turbo, S. longicosta* and *C. oculus* are found, on average, in the earlier sites. However, the mean sizes of *Perna* and *H. spadicea* are largest in the post 2000 B.P. sites. The overall conclusion that can be drawn from the data on shellfish mean sizes is that during periods of low predation (i.e. low relative numbers of a species within a site/unit) the size of all five species, on average, is largest; conversely, when a species is heavily exploited the mean size decreases. The length of time that a site is occupied (i.e. not only during spring low tides) and the tidal conditions at the time of collection may also have a significant effect on mean sizes as generally the smaller specimens of a particular species are found in the upper reaches of the intertidal zone. The age of a site, its location or type (ie. single occupation or multiple occupation) do not appear to have had a significant influence on the mean size of shellfish collected.

A number of other factors are also likely to have influenced the shellfish collection strategies of the BBF inhabitants. These include palaeoenvironmental factors such as rising and falling sea levels, sea temperature changes and changes in the morphology of the coastline. Changes in sea levels are not considered a major influencing factor on shellfish availability as suitable habitats for all the species found at BBF were present throughout the Mid- and Later Holocene. Blombos Beach is likely to have been inundated during periods of higher sea levels during the Mid-Holocene, but this would have affected only one species, *Donax serra* and may explain the absence of this species in the Mid-Holocene sites. Changes in sea temperatures may have had a marginal effect on the growth rate of some species but, overall, the shellfish evidence from BBF, Nelson Bay Cave (Klein 1973) and Byneskranskop 1 (Schweitzer & Wilson 1982) suggests that changes in sea temperatures did not substantially affect the range of shellfish species available during the past 6000 years.

Consistent human predation of a single shellfish species has been shown to decrease the mean size of animals available for collection both in modern studies (Bigalke 1973; Lasiak & Dye 1989; Tregoning & van der Elst) and at single occupation archaeological sites (Parkington *et al* 1992). Based on the evidence available from the BBF sites it is prudent to conclude that during periods of heavy predation by humans on a species, particularly those that are long lived, the mean size of animals available for collection may decrease. Conversely, if a population is left relatively undisturbed, possibly for only short periods of time, the mean size of that species will consequently increase.

Comparing the patterns of shellfish exploitation at BBF with those from other southern and south-western Cape sites has proved to be a difficult task. In part, this is due to the general lack of shellfish data recorded at some of the excavated sites, but also due to differences in the ecology of the various regions. In particular, the range of shellfish species recovered from some sites in the south-western Cape is not comparable to genera from the BBF sites.

Perhaps the biggest hurdle in attempting to interpret changes in shellfish strategies at BBF, and at the other excavated sites in the southern Cape is the large time gaps between the various occupation units. In effect, we are only able, temporally, to get a 'snap shot' view of the various units, which may be separated by more than 1000 years. These time gaps make it difficult to attribute changes, for example, in shellfish sizes to a specific cause. In consequence, we are only able to generalise about changing shellfish strategies, both on a temporal and spatial scale.

CHAPTER 7

FAUNA: MAMMALS, REPTILES & FISH

7.1: Introduction

At least fifty species of large mammals are recorded historically in the Cape Ecozone (Skead 1980; Skinner & Smithers 1990). Travellers passing through the Riversdale district during the 18th and 19th C. reported seeing elephant, Cape buffalo, hippopotamus, eland, lions. leopards, wild dogs, hyaenas and a range of bovids including eland, bush buck, steenbuck and bontebok (le Vaillant 1790; Raven-Hart 1967; Skead 1980). Based on the faunal evidence recovered from archaeological sites excavated in the Cape Ecozone we can establish that by the Mid-Holocene the large mammal communities in the southern Cape were similar to those of historical times (Klein 1973, 1980, 1984; Deacon, J. 1984b; Deacon & Lancaster 1988). We can therefore speculate on the range of large mammals that would have been available to the prehistoric inhabitants of the BBF sites. Unfortunately, the bones of large mammals are poorly preserved in the early open Type 1 sites, and are absent in the Type 3 site. It was therefore not possible to establish the range of large mammals which were hunted, or possibly scavenged, in the BBF area prior to 2000 B.P. The best preservation of large mammals comes from the Type 2 sites, BBC (all layers) and BBF 9 and this information is presented below.

In addition to the large mammals a wide range of other animals were also available for exploitation at BBF including small mammals, reptiles, birds and fish. Some information on this latter group of animals is available from the earlier sites, but again the best bone preservation occurs in the later, near coastal, shelter sites.

The mammal bones from the BBC & BBF 9 sites were identified by Richard Klein, Graham Avery, Cedric Poggenpoel and the author. Microfauna from the BBC site were identified by Margaret Avery. Cedric Poggenpoel analysed the fish bones. Bird and snake bones were separated from other fauna but in the time available it was not possible to locate an expert to identify these to genera.

7.2. Mammals

NISP's and MNI's for the mammals recovered from BBC (all units) and BBF 9 were calculated by Richard Klein and are presented in Table 7.1. below. Mammal bones recovered from the other BBF sites were badly weathered or fragmented and it was not possible to identify these to genera. An analysis of the mammal bones from the later 1997 – 1999 excavations of the LSA layers at BBC are detailed in Henshilwood *et al* 2001a.

Frequencies of individual taxa per layer are generally too low to allow a meaningful interpretation of the faunal data. Large bovids occur in marginally greater numbers in the lower BBF layers which date to ca. 1800 B.P., but this may be attributed to the relatively larger volume of deposit excavated from layers BBC L4 & BBC L5. Animals in this category include *Syncerus caffer* and *Taurotragus oryx*; both animals are found in the Holocene layers at NBC, Die Kelders and Byneskranskop 1 indicating their widespread distribution in the southern Cape. The largest NISP's and MNI's are recorded in the small and small-medium bovid size classes. *Oreatragus, Sylvicapra, Raphicerus* and *Tragelaphus.*are still found in the BBF area today and it is likely that these bovids were available for hunting or snaring within the immediate BBF vicinity. The range of bovids found at BBF are dominated by browsers indicating that scrub and bush were the predominant vegetation types in this area in the Late Holocene; large mammal communities in the southern Cape were essentially similar to historic times by 5000 B.P. (Klein 1980; 1984; Deacon & Lancaster 1988). It is probable, therefore, that the range of mammals available to the Late Holocene BBF inhabitants was similar to that in the Mid Holocene.

Hippopotamus amphibius bones are found in layers BBC L3 and BBC L4, but possibly come from the same animal. Historically, hippo were observed in the Goukou and Duivenhoks Rivers which are situated more than 20 km from BBF. As hippo are unlikely to have been found within the immediate BBF area the bones may have been carried here from either of the rivers. Hippos occur in most layers at NBC, and occasionally at Byneskranskop and Die Kelders; however, we have no indication of how these animals were captured although it is seems more likely that hippo carcasses were opportunistically scavenged and not hunted.

No colonies of *Arctocephalus pusillus* or other seal species are currently found in the vicinity of the BBF coast, but occasionally single animals are observed basking on the rocks or on Blombos Beach. In the past, seals may have been opportunistically hunted or clubbed but the relatively small numbers found in the BBC layers do not give any indication of whether these animals were hunted or scavenged on a regular basis.

Order/ Species	**BBC L2**	**BBC L3**	**BBC L4**	**BBC L5**	**BBC L6**	**9**
Insectivora,Leporidae, Rodentia, Hyracoidea						
Erinaceus frontalis	0/0	0/0	0/0	0/0	2/1	0/0
Lepus saxatilis	2/1	1/1	13/2	0/0	0/0	0/0
Bathyergus suillus	27/2	64/3	269/14	162/10	82/4	1/1
Procavia capensis	92/5	6/1	14/1	12/1	0/0	23/6
Carnivora						

Mellivora capensis	0/0	0/0	2/1	0/0	0/0	0/0
Felis libyca	0/0	1/1	1/1	1/1	0/0	0/0
Pinnipedia						
Arctocephalus pusillus	3/1	10/1	62/2	4/1	2/1	0/0
Delphinidae						
Delphinus delphis?	0/0	0/0	4/1	11/1		22/1
Artiodactyla						
Hippopotamus amphibius	0/0	2/2	1/1	0/0	0/0	0/0
Bovidae						
Oreatragus oreatragus	1/1	0/0	1/1	0/0	0/0	1/1
Sylvicapra grimmia	0/0	0/0	0/0	0/0	0/0	3/1
Raphicerus campestris	0/0	0/0	3/2	0/0	0/0	1/1
Raphicerus melanotis	1/1	0/0	16/6	0/0	0/0	2/1
Raphicerus sp.	12/2	5/3	83/9	3/1	0/0	0/0
Ovis aries	0/0	0/0	4/1	1/1	1/1	0/0
Tragelaphus scriptus	0/0	0/0	0/0	0/0	0/0	1/1
Taurotragus oryx	1/1	0/0	6/1	0/0	0/0	0/0
Syncerus caffer	0/0	0/0	5/1	0/0	0/0	0/0
Small Bovid	92/2	37/3	271/9	42/2	5/1	7/4
Small-Medium Bovid	5/1	0/0	20/1	5/1	3/1	1/1
Large-Medium Bovid	6/1	7/2	44/1	16/1	4/1	1/1
Large Bovid	6/1	3/1	88/3	30/2	5/1	0/0

Table 7.1: BBC (all layers) & BBF 9: Mammal NISP's and MNI's

Only two species of small carnivores were recovered at BBC, *Mellivora capensis* and *Felis libyca.* Both may have used the cave site as a lair and may not have been hunted. They both occur in various layers at NBC, Die Kelders and Byneskranskop 1.

The hedgehog, *Erinaceous frontalis*, is rare in the southern Cape today (Stuart & Stuart 1988, 2001; Skinner & Smithers 1990), yet interestingly is found both at BBF and Die Kelders (Klein pers. comm.). Factors such as extended droughts or high rainfall can lead to rapid declines in hedgehog populations (Stuart & Stuart 1988, 2001; Skinner & Smithers 1990). Changes in the ecology of the region in the Late Holocene may be one of the causes for their absence in the upper BBF layers.

It is surprising that the scrub hare, *Lepus saxatilis*, is not more common at BBC as large numbers are sighted at night in the BBF area today. However, as they are nocturnal animals they lie up in thick scrub during the day, hence making them difficult to catch unless they are snared. The most common small mammals at BBC & BBF 9 are Cape dune mole-rats, *Bathyergus suillus* (Henshilwood 1997) and hyraxes, *Procavia capensis.* Cape dune mole-rats are ubiquitous in almost all layers at Byneskranskop 1 and Die Kelders but are absent at NBC (Inskeep 1987), perhaps due to differences in environmental conditions in the latter area (cf. Stuart & Stuart 1988:94, 2001). *Procavia capensis* are present, but considerably less common than Cape dune mole-rats at all three sites. Further details of these two species, which are prevalent in large numbers in the BBF area today, are discussed below.

Bathyergus suillus

Cape dune mole-rats are common in the sandy soils of the southern Cape and may weigh up to 750 g. Although they live underground in extensive burrows they are relatively easily captured as they move to the surface at night or when they leave their burrows during heavy rain. A study by the Department of Nature Conservation showed that dune mole-rats are most active during the mid-winter months suggesting they could be most easily hunted at this time (Schweitzer 1979:206). Cape dune mole-rats are considered a delicacy by some local folk in the Riverdale area and are still hunted for their meat (Henshilwood 1997); their pelts may also have been used in the past although recent investigations into the viability of commercially farming dune mole-rat for their pelts have not proved successful (*cf.* Schweitzer 1979:205).

As the BBC & BBF 9 sites are situated in the steep coastal cliffs they are unlikely to have been accessible to burrowing dune mole-rats (Jarvis pers.comm.); additionally there were no signs of burrows in the stratigraphy at either site, suggesting the animals were brought to the site as food, either by humans or animals. The incisors in the premaxilla and mandible are used for digging and are permanently exposed in live animals. A thin layer of skin forming the animals nose covers the premaxilla, but the mandibles are well protected by a thick layer of fur and skin. Eagle owls and small carnivores prey on Cape dune mole-rats and some may have been brought to the sites by these agents (Henshilwood 1997).

The author observed the manner in which local people cooked dune mole-rats; the animal is placed on its back in a bed of hot coals and allowed to roast for 20-30 minutes. In each of three cases observed, the skin covering the premaxilla was burnt away and the premaxilla charred (Fig. 7.1). Both the upper and lower incisors, being exposed, showed evidence of burning. However, the mandibles which were protected by a layer of fur, remained unburnt (Henshilwood 1997).

Fig. 7.1. *Bathyergus suillus*: areas that are charred during cooking on open coals.

Bearing in mind the burning patterns seen in the above examples, all the mole-rat bones from the five LSA units at BBC were examined for charring. Less than 10% of the post-cranial bones show evidence of burning. Those that are burnt constitute a random selection of body parts suggesting that burning took place after the animal had been disarticulated and possibly post-depositionally. Examination of the cranial bones shows that the crania are unburnt but distinct burning patterns are observable on the incisors, premaxillae and mandibles (Table 7.2). Of the mole-rat premaxillae from the BBC units, 89% show evidence of burning and 11% are unburnt. Of the premaxillae incisors, 94% are burnt and 6% unburnt. Of the 53 mandibles examined, 9·5% are burnt and 90·5% show no evidence of burning. All the mandibular incisors are burnt (Henshilwood 1997). These results closely parallel the burning patterns noted in the local observations above. We can therefore conclude that most of the dune mole-rats in the BBC LSA assemblage were brought to the site by its human inhabitants, probably cooked at the cave in the same manner as described above, and then eaten on site.

The relatively high numbers of mole-rats found at other archaeological sites in the Cape littoral zone show that these animals were commonly sought after, probably as a source of food. The BBC evidence points to the likelihood that humans, and not animals, were responsible for the presence of mole-rats at many other sites (Henshilwood 1997).

BBC Unit	**Premaxilla**		**Incisors in Premaxilla**	
	Burnt	**Unburnt**	**Burnt**	**Unburnt**
L2	0	1	0	1
L3	1	0	2	0
L4	10	1	18	0
L5	3	0	6	0
L6	2	0	4	0
Total	**16**	**2**	**30**	**1**

BBC Unit	**Mandible**		**Incisors in Mandible**	
	Burnt	**Unburnt**	**Burnt**	**Unburnt**
L2	0	4	4	0
L3	0	2	3	0
L4	2	22	21	0
L5	2	16	15	0

L6	1	4	2	0
Total	**5**	**48**	**45**	**0**

Table 7.2: Evidence of burning on *Bathyergus suillus* mandibles, premaxillae and incisors from BBC (all layers)

Procavia capensis

Hyraxes increase in number in the upper levels at BBC and at BBF 9 suggesting greater human predation on this species after ca. 500 B.P. although the sample size is too small to draw any positive conclusions. Rocky areas, small caves and crevices are the favoured habitat of hyraxes and it is possible that some hyraxes died naturally at BBC & BBF 9. All the recovered hyrax bones were examined for cut marks or burning; cut marks were found at the base of the ascending ramus on two samples; burning was visible on a scapula and skull fragment. The position of the cut marks is consistent with those made during skinning, suggesting that hyraxes may have been hunted for their pelts and meat. Historically, the San were recorded wearing the skins of 'rock rabbits' or hyraxes made into cloaks (Raven-Hart 1967).

A traditional method for establishing the age of an animal is based on the evaluation of dental eruption (Geering 1982; Klein & Cruz-Uribe 1984). There is a distinct birth season for hyraxes; in the southern and south-western Cape it is usually in September or October and coincides with the time that *fynbos* is in prime condition at the end of the winter rains (Stuart & Stuart 1988, 2001; Skinner & Smithers 1990:557). Tooth eruption patterns in juvenile hyraxes are strongly correlated to age, thus allowing the age at time of death to be established. If the hyraxes found at the BBC & BBF 9 sites were brought to the sites by humans we should be able to establish the season of occupation.

Tooth eruption patterns from six complete hyrax mandibles and two maxillae recovered from BBC & BBF 9 were recorded. These were sorted into left and right and the length of each measured according to the method recommended by Richard Klein (Table 7.3).

Tooth eruption patterns were compared with those of 22 hyrax specimens of known age which had been collected at De Hoop Nature Reserve and are housed at the Iziko-South African Museum. Based on the dental eruption patterns of the BBF hyraxes the estimated ages at the time of death were calculated Unfortunately, the BBF hyrax sample is too small to draw any definite conclusions as to seasonality, but based on the BBC layer L2 results it is possible the site was occupied during autumn (March/April) and the BBF 9 site in the late winter (August/September).

Site/ Layer	Est. Age (months)	Mandible/ Maxilla	Left/ Right	Length (mm)	Tooth Eruption Patterns

BBC2	1-2	Mn	R	27	dI^1 dI^2 dP1 dP^2 dP^3 edP^4
BBC2	12-15	Mn	L	43	I^1 I^2 dP^1 dP^2 dP^3 dP^4 M^1 eM^2
BBC2	12-15	Mn	L	49.5	I^1 I^2 dP^1 dP^2 dP^3 dP^4 M^1 eM^2
BBC2	12-15	Mx	R	?	P^1 P^2 P^3 dP^4 EP^4 M^1 eM^2
9	4	Mn	R	33	dI^1 dI^2 dP^1 dP^2 dP^3 dP^4 eM^1
9	4	Mn	R	32	dI^1 dI^2 dP^1 dP^2 dP^3 dP^4
9	2	Mn	L	27	dI^1 dI^2 dP^1 dP^2 dP^3 edP^4
9	12-15	Mx	L	44	dP^1 dP^2 dP^3 dP^4 M^1 eM^2

Table 7.3: Estimated age at time of death of *Procavia capensis* specimens from BBC layer L2 & BBF 9 based on dental eruption patterns.

Cetacea

There is no record of cetaceans being hunted by indigenous people at the Cape, therefore the most likely method of acquiring whale or dolphin meat was by scavenging wash-ups. Augustin de Beaulieu, who visited the Cape in 1620, observed that local people 'who own no stock', (Raven-Hart 1967:100).

'...go along the seashore, where they find certain shellfish, or some dead whales or other fish, however putrefied it may be, and this they put on the fire and make a good meal of it'

No direct evidence of whales was found at any of the BBF sites but two barnacles, *Coronula diadema*, were found in the BBF 9 deposits. These barnacles attach themselves to humpback whales (*Megaptera novaeangliae*), Blue whales (*Balaenoptera musculus*), sperm whales (*Physeter macrocephalus*) and southern right whales (*Eubalaena australis*) suggesting that whale meat, possibly scavenged from a washed up whale, was brought to the site with the barnacles attached.

Whale barnacles (*C. diadema*) have been identified from a number of sites on the west Cape coast including Eland's Bay Cave, Dune Field Midden and Duiker Eiland; cetacean bones and *Coronula* barnacles were recovered from a series of Later Stone Age middens south of Eland's Bay dated to ca. 2100 B.P. and 2380 B.P. (Jerardino & Parkington 1993). The authors point out that whale strandings must have periodically offered large amounts of food to coastal dwellers and the location of the stranded whale may have influenced the location of temporary settlements; in the case of the Eland's Bay middens these were located in the dune cordon immediately adjacent to the beach (Jerardino & Parkington 1993:3).

No diagnostic whale bones were found at BBF 9, which is not surprising in view of their weight (*cf.* Jerardino & Parkington 1993), but circumstantial evidence points to the southern right Whale being the most likely host. St. Sebastian Bay has been identified as one of the main calving areas for this species during the winter months, from around May to October (Best pers. comm.; Stuart & Stuart 1988, 2001). Pods of southern right whales have been observed by the author less than 100 m from the shore near Blombos Beach and local inhabitants recall southern right whales being washed ashore in the recent past. If the *Coronula* barnacles found at BBF 9 were from southern right whales, then it seems likely the site was occupied during the winter months.

Dolphins, possibly *Delphinis delphis* (Best pers. comm.; Stuart & Stuart 2001), are found in the lower BBC layers and at BBF 9; these were probably also wash-ups on the beach or rocks which were scavenged.

7.3: Domestic Animals

Ovis aries

Sheep bones were identified from Layers L4, L5 & L6 at the BBC site (Henshilwood 1996). Two sheep bones from Layer L5 & L6 were submitted for accelerator radiocarbon dating to the Research Laboratory for Archaeology and the History of Art at Oxford University (Henshilwood 1996; Table 7.4).

From travellers descriptions, and the Resolutions of the Dutch East India Company at the Cape it is clear that the Khoe were well established in the Riversdale region by the 17th C (*cf*. Ch. 3) and the presence of sheep in the lower BBC layers confirms a long history of pastoralism in this area. The BBC site was repeatedly occupied during the last two millennia and it seems certain that the early occupants of this site were in contact with domestic stock shortly after 2000 B.P. In Chapter 4 (Section 4.5) the origins of the Khoe, their likely migration routes and the timing of the arrival of sheep at the Cape are discussed more fully; a review of the salient points is presented below.

Sealy & Yates (1994) argue that the early dates for the presence of sheep at Die Kelders (1960 ± 85 B.P.), Nelson Bay Cave (1930 ± 60 B.P.) and Byneskranskop 1 (1880 ± 50 B.P) (cf. Schweitzer 1974, 1975, 1979; Schweitzer & Wilson 1982; Klein 1986) may be incorrect as they were calculated by associating sheep bones with recovered charcoal from within stratigraphic layers. In his report on Nelson Bay Cave, Inskeep (1987:258) expresses doubts about the dates for sheep from this site and points out that the reliability of the association of sheep bone and radiocarbon dates is far from certain. As a result of this uncertainty a sheep bone, recovered from an NBC layer radiocarbon dated at 1930 ± 60 B.P., was submitted for direct dating. The result, obtained by the accelerator radiocarbon method, dated the bone at only 1100 ± 80 B.P. (Gowlett *et al* 1987; Inskeep 1987).

Ref. No.	Layer	Body Part	$\delta^{13}C$	Date: B.P.
OxA-4343	5	Left mandible	-12.6 per mil	1960 ± 50
Oxa-4544	6	Calcaneum	-12.9 per mil	1880 ± 55

Table 7.4: Accelerator radiocarbon dates for *Ovis aries* from Layers 5 & 6, BBC. (The date are uncalibrated in radiocarbon years B.P. (Before Present - AD 1950) using the half life of 5568 years)

In order to obtain direct dates for the earliest sheep recovered from Die Kelders, Byneskranskop, Kasteelberg (Western Cape) and Spoegrivier (Northern Cape), Sealy and Yates (1994) submitted sheep bone from these sites for accelerator radiocarbon dating. At both the south-western Cape sites, Die Kelders (1325 ± 60 B.P.) and Byneskranskop (1370 ± 65 B.P.) the dates were younger. The oldest dates for sheep came from the northern Cape site, Spoegrivier (2105 ± 65 B.P)., and from Kasteelberg (1630 ± 60 B.P.), situated in the western Cape.

Because of the small sample size tested, Sealy & Yates (1994) are cautious in their interpretation of this new evidence but suggest the results support a west coast route for the introduction of sheep to the Cape region (*cf*. Ch. 4). Tentatively, they also suggest that the arrival of pottery at the Cape may not be associated with the arrival of herders (also *cf*. Mazel 1992), and point out that a number of authors (e.g. Deacon 1984; Klein 1986) have recorded that 'early dates for pottery are more common than those for sheep' (Sealy & Yates 1994:64); an example is Die Kelders where more than 1000 sherds were recovered in Layer 12 dated at 1960 ± 85 B.P. (Schweitzer 1979:158).

A small quantity of pottery was recovered from the same layer (BBC layer L5) as the sheep mandible radiocarbon dated to 1960 ± 50 B.P. (Henshilwood 1996) suggesting that at this site pottery and sheep are contemporaneous. As sheep were present in the BBF area at around 2000 B.P., it seems unlikely they were confined only to this immediate region. From the small number of sheep bones at BBC we are unable to gauge the extent of herding in the southern Cape at the time, but it is reasonable to argue that sheep may also have been present elsewhere in the Cape littoral zone, for example in the vicinity of Die Kelders and Byneskranskop 1 situated 200 km to the west, or at Nelson Bay Cave to the east (Henshilwood 1996).

The early dates for sheep from BBF also leave the proposed routes for the introduction of herding to the Cape open to interpretation. As Sealy and Yates (1994:64) point out, stock-keeping may have spread so fast throughout the Cape region that we may be unable to resolve its source, or direction of movement, from radiocarbon dates alone. At this stage a western or eastern route for the introduction of sheep and pottery is possible; perhaps we need to know more about the interaction between Later Stone Age people and Iron Age communities in the northern and eastern parts of

South Africa before this complex issue can be resolved (*cf.* Sealy & Yates 1994:65; Schweitzer 1979:216).

Whether the skills of pottery making accompanied the introduction of domestic animals to the Cape, or whether they were introduced from elsewhere at more or less the same time remains an open question (*cf.* Inskeep 1978; Deacon 1984; Schweitzer 1979; Henshilwood 1996).

If the picture is restored of sheep and pottery being contemporaneous, as seems to be the case at BBC, they may not necessarily have formed part of a 'package' brought to the region by Khoekhoe herder groups constituted in the way described in historical documents (e.g. Kolben 1738). Finely made pottery recovered from the early layers at Die Kelders (Schweitzer 1979; Klein pers. comm.) and possibly Boomplaas (Deacon *et al.* 1978) suggests ancient pottery making skills were brought to the Cape at an early stage. The 'bowl form' earthenware from these two sites may represent the craft of the earliest potters in the Cape, a skill that may have been lost or adapted. During the 400 years after c. 2000 B.P. the practice of stock-keeping and pottery manufacture gradually increased within the region with the arrival of further pastoralists and continuing acculturation amongst indigenes. After 1600 B.P., stock-keeping became well established in the Cape, sheep were the main domesticates and cattle were also present (cf. Deacon, J 1984b; Klein 1986; Sealy & Yates 1994; Henshilwood 1996; Sadr *et al*; 2003).

The origins of Khoekhoe herders at the southernmost Cape may relate to the early arrival of small stock between 2000 B.P. and 1600 B.P., but the traits typically associated with large Khoekhoe herding groups, such as are documented for the historical period including material culture, hierarchical group structures, clan affinities and territorial control (cf. Kolben 1738; Epstein 1937; Deacon 1984; Klein 1986; Smith 1990 a,b; Sadr *et al* 2003), may only have developed more recently (Henshilwood 1996).

Establishing whether hunter gatherers or herders were responsible for the accumulation of layers L4, L5 & L6 at BBC is a difficult task, partly because of the small quantities of sheep bone recovered. A review of the evidence from sites which contain sheep, given below, highlights some of the difficulties in distinguishing between herder and hunter sites at the Cape.

Sheep are infrequent in the Nelson Bay Cave units, and consequently Inskeep (1987:259) suggests it unlikely the NBC site was used as a kraal, but rather that sheep were brought to the site by hunter gatherers who had acquired them by capture, or barter, from local herders. Schweitzer (1979:203) carried out a detailed study on the age groups and sex ratios of sheep from Die Kelders site but the results were too inconclusive to make a definitive statement as to the economic identity of the sites inhabitants. He tentatively suggests that hunter gatherers probably acquired the sheep found in the lower layers by theft or barter, although the occupants of Layer 2 and above may have been herders who were managing their flocks. As *Ovis aries* are restricted to Layer 1 at Byneskranskop 1, with low frequencies occurring within each sub-unit, Schweitzer & Wilson (1982:162) avoid speculating as to the identity of the occupants of these levels, or how the sheep were acquired.

Some authors argue that a clear cut case can be made for distinguishing between the economic and social differences of hunters and herders at some sites. For example, an abundance of domestic stock in successive layers at Kasteelberg is interpreted by Klein (1986) as being indicative of a herder site (also *cf*. Smith 1986; 1987; 1990 a, b; Smith *et al* 1991; Smith & Woodborne 1994; Sadr *et al* 2003). Calcined dung layers in the upper units at Boomplaas are cited as evidence that the site was used as a sheep kraal (Deacon, H.J *et al* 1978; Deacon, H.J. 1979; von den Driesch & Deacon 1985).

Hunting and herding are also viewed as separate economic categories by Parkington (1984); hunters utilise wild resources and exist on the fringe of herding societies. Although they occasionally may enter into client relationships with herders they also steal animals from Khoekhoe herds. As hunters and herders have distinct social and economic systems, Parkington (1984) suggests the two groups should be identifiable archaeologically. Schrire (1984, 1992) supports Elphick (1977, 1985) who describes the differences between a hunting and herding way of life as being exaggerated. Both authors agree there was a great deal of overlap between social and economic categories; consequently hunters who obtained stock could become herders and herders who lost their stock reverted to hunting and gathering (also *cf*. Goodwin 1952; Klein 1986; Sadr *et al* 2003).

Although Smith (1986; Smith *et al* 1991) has pointed out that the economic systems and social organisation of the Khoekhoe and San are likely to have been very different there are a number of similarities in the subsistence strategies of both groups. For example, the littoral zones of the Cape were utilised by Khoekhoe and San for hunting, collecting shellfish and plant foods. Their technology was also very similar (*cf*. Schapera 1926, 1933) and although some utensils, for example milking bowls, were characteristically used by herders these were made of organic materials and have not survived (Schapera 1933; Avery 1976; Hall 1986; Klein 1986). On archaeological grounds, it is therefore often difficult to distinguish between occupations by herders or hunters. Hunters opportunistically stole Khoekhoe stock, or acquired them though barter, and the presence of domestic animals at a site is therefore not conclusive evidence of the identity of its occupants.

Initial contact between San and Khoekhoe in the early part of the second millennium may have been amicable but as the competition for available resources increased San subsistence rounds were probably disrupted by expanding Khoekhoe demands for grazing land and territory on the Cape coastal plain. San groups increasingly used the marginal inter-montane and remote coastal areas for subsistence; raids on Khoekhoe stock by San people led to retaliatory attacks and a common enmity. In the post 2000 B.P. period the numbers of sites situated in small shelters in the inland Cape Folded Mountains and remote coastal areas increased rapidly (Hall 1986; Parkington *et al* 1986; 1988; Parkington 1987; Deacon & Deacon 1999; Mitchell 2002).

All seven of the occupation units which post-date 2000 B.P. at BBF are located in two small shelters immediately adjacent to the coast. Gaining access to the small BBC site, situated in the coastal cliffs, involves a long scramble over boulders along the coastline, followed by a fairly arduous climb from below; the cave is inaccessible from above. It seems highly unlikely that a group of herders would choose to camp at this site, particularly as their stock could not be corralled overnight within close proximity of the cave, thereby leaving the animals vulnerable to predators.

The inaccessible location of BBC, its small size, and the low frequency of sheep bones found in the lower units suggests rather that the site was occupied by hunter gatherers, possibly a small domestic group (*cf*. Parkington & Mills 1991). The nutrient rich *fynbos* found in the BBF region is well suited to grazing sheep (*cf*. Ch. 2), and it seems likely that herders with small stock were present in the area at the same time that the BBC site was occupied by San hunter gatherers or dispossessed Khoekhoe. Whether the sheep at the site were acquired through barter, or stolen from the Khoekhoe, is open to debate; in either event the presence of sheep at BBC suggests that contact was being made between hunters and herders in the BBF area shortly after 2000 B.P.

7.4: Micromammals

Dr. Margaret Avery at the Iziko-South African Museum identified the micromammals from BBC (Table 7.5) and the report below is based on her interpretation; due to the very low frequency and/or poor condition of the micromammalian remains recovered from BBF 7 and BBF 9 it was decided to exclude them from the study. Minimum numbers of individuals were based on mandibles and maxillae only, as is the practice in micromammalian studies. Scores were calculated for individual excavation units, as given in the cave matrix (*cf*. Ch. 5) and then summed to provide scores per layer.

A complete bat skeleton, with fur attached, supports the contention that bats are likely to have been roosting in the cave and to have died there naturally. A few of the shrews jaws contain teeth that have been attacked by salt (possibly from the deposit) or predator stomach acid. Possibly they were eaten by a small mammalian carnivore. The remainder of the collection is consistent with accumulation by barn owls (Avery pers. comm.).

In almost all cases the species are what one would expect in the area today. One possible exception is the red veld rat, *Aethomys chrysophilus,* which presently occurs in savanna areas further north. One would expect the species represented to be *A. namaquensis.* The occurrence of the lesser dwarf shrew, *Suncus varilla*, constitutes a slight range extension on the basis of the map given by Skinner & Smithers (1990). This, however, is not significant because the species certainly covers a wider area than is indicated by the map. For instance, they have been found in modern barn-owl pellets at the Wilderness (Avery 1982a) which is not reflected on Skinner & Smithers map (Avery pers. comm.).

Conversely. the gerbil specimens have been assigned to the Cape gerbil, *Tatera afra,* on the grounds of the present distribution of this species, since it has so far proved impossible to identify *Tatera* spp. to species on cranial material. The fat mouse material has been assigned to Kreb's fat mouse, *Steatomys krebsii* for the same reason. It is also considered that the specimens assigned to Verreaux's mouse *Myomyscus verreauxi* are more likely to represent this species than the multimammate mouse, *Mastomys coucha*, on general distributional grounds, although the ranges of the two overlap in this vicinity.

The presence of *Steatomys krebsii* is of interest as it is also only found in the Later Stone Age layers from Boomplaas Cave and Die Kelders. It seems that this species did not occur in the southern and south-western Cape until after the Last Glacial Maximum (Avery 1982a).

Some general environmental conditions may be discerned from the micromammalian data. Rank, grassy vegetation seems to be emphasised by the BBC Layers L5 & L6 sample, although *Steatomys krebsii* suggests relatively dry grass on a sandy substrate, particularly during the occupation of Layers L3 & L4. The Namaqua rock mouse, *Aethomys namaquensis*, indicates scrub on hillsides. Subsequently, there is some indication of drier, rather more open vegetation. The apparently wetter conditions indicated in the early samples dating to about 1800 B.P. are similar to the evidence from the west coast at Spoeg Rivier (Avery pers. comm.). Here relatively benign conditions are suggested about the same time in a harsh environment (Avery 1992).

Species	**Common Name**	**8/1**	**BB C L2**	**BB C L3**	**BB C L4**	**BB C L5**	**BB C L6**
Mysorex varius	forest shrew	1	2	1	2	1	3
Crocidura flavescens	greater musk shrew	1			1		
Crocidura cyanea	reddish-grey musk shrew	4	2		1		
Suncus varilla	lesser dwarf shrew	3	1	1			
Rhinolophus clivosus	Geoffroy's horseshoe bay	6	9	1	7	2	

Rhinolophus capensis	Cape horseshoe bat		2				
Minitopterus schreibersii	Schreiber's long-fingered bat	1	1		1		1
Otomys irroratus	vlei rat	5	6	4	10	3	8
Tatera afra	Cape gerbil			1	2	1	
Mystromys albicaudatus	white-tailed rat			1			
Dendromus mesomelas	Brant's climbing mouse	1			1		1
Steatomys krebsii	Kreb's fat mouse	1	1	3	2	1	1
Acomys subspinosus	Cape spiny mouse		1	1	1		
Rhabdomys pumilio	striped mouse	3	6	2	7	3	5
Mus minutoides	pygmy mouse				1		
Myomyscus verreauxi	Verreaux's mouse	1	1				1
Aethomys sp.							1
Aeothomys chrysophilus	red veld rat	2	2		1		
Aeothomys namaquensis	Namaqua rock mouse					1	
Total		29	36	13	37	12	20

Table 7.5: MNI's of micromammals at BBC

(species identification by Dr. M. Avery, South African Museum)

7.5: Reptiles

1. Tortoises

Indigenous people at the Cape are recorded eating tortoises and also using tortoise shells as drinking receptacles and storage containers (*cf.* Ch. 8). This extract is from the journal, dated 1673, of Wilhelm ten Rhyne (Schapera 1933:121).

They do sometimes use cups.....or the shells of tortoises which they have eaten. These they call sirigoos, and roast them in the ashes and eat them

Simon van der Stel, on a journey to the Namaquas in 1685, describes Sonqua (San) they meet at Vier-en-Twintig Rivier (Conradie 1934:38)

even poorer than the Gregriquas are the Sonquas, who must survive on bulbs, 'uintjies', tortoises, grubs and locusts

Chersina angulata

Surprisingly, tortoise bones are relatively well preserved at most of the BBF sites. Perhaps, the small size of the bones and carapace at open sites ensured they were rapidly buried after deposition by aeolian dune sand thus preserving them, unlike the weathered and fragmented large mammal bones from the same sites.

In common with Die Kelders and Byneskranskop, only one species of land tortoise, *Chersina angulata*, occurs at BBF sites. One other species of land tortoise, *Homopus areolatus*, is commonly found in the southern Cape but it is much smaller than *Chersina* which may weigh up to 1,5 kg (Branch 1990). Perhaps the small size of *Homopu*s, and its habit of hiding under rocks and bushes, accounts for its absence at southern Cape sites. Tortoise bone and carapace recovered from each site was weighed to determine the percentage of tortoise bone relative to the total mass of the recovered assemblage (stone excluded) (Table 7.6)

Site	**Tortoise Mass (g)**	**Total Mass (g) excl. stone**	**% of Tortoise to Total Mass**
BBF 1	7636	33481	22.8
BBF 2	8652	78973	11
BBF 3	1129	96296	1.2
BBF 4	339.4	92184	0.4
BBF 7	1652	62928	2.6
BBC	1966	101525	1.9
BBF 9	897	89577	1

Table 7.6: BBF : Percentage of Tortoise mass (g) to Total mass (g) (excl. stone) by site

The highest percentage of tortoises are found in the two oldest sites, BBF 1 & 2. This phenomenon cannot be ascribed only to preservation; certainly the absence of large mammal bones at these two sites increases the percentage of tortoise relative to the total mass of the assemblage, but then we would expect the same results from the BBF 3, 4 and 7 sites but this is not the case. Due to an absence of evidence it is difficult to gauge the proportionate weight that large mammal bones would have contributed to these four sites, nevertheless it does seem that tortoises were more actively hunted (or gathered) in the earlier sites, than in the later ones.

Schweitzer & Wilson (1982:119) note that tortoises are more abundant during dry conditions than wet; the high percentages of tortoises at BBF 1 & 2 (ca. 6960 B.P. - 6740 B.P.) may therefore indicate drier conditions during this period. Renewed aeolian activity and inland soil erosion, which are indicative of dry periods, are recorded by Butzer (1974) from the Wilderness Lakes area after 7000 B.P. Similarly, Butzer & Helgren (1972) mapped renewed sand mobilisation on the Robberg Peninsula from 7000 B.P. and Tankard (1976a) reports renewed deposition of dry shelly sands at Die Kelders at around 6000 B.P. A synthesis of palaeoclimatic data for the period 7000 B.P. - 4000 B.P. (Cockroft *et al* 1987; Deacon and Lancaster 1988; Tyson & Lindsay 1992; Barrable *et al* 2002; Bateman *et al* 2004; Carr *et al* 2006, 2007) indicates increasing summer rainfall and a decrease in winter rainfall in the general southern Cape area although this may not apply specifically to the BBF area which today has a lower mean precipitation than the intermontane and eastern sector of the region (*cf*. Ch. 2).

Relatively high percentages of tortoise are recorded in the layers at Byneskranskop 1 which date to ca. 6000 B.P., but as tortoise is so common in almost all layers at this site it is difficult to draw any conclusions concerning palaeoenvironmental change from the data (Schweitzer & Wilson 1982:119).

Mean individual sizes for tortoise from the BBF sites were calculated by measuring the breadths of the distal humeri (cf. Klein & Cruz-Uribe 1984:97). The breadth of the humerus bone represents the size of the tortoise, and estimates of average size within a layer or phase can be made after measuring the specimens present in the layer. Tortoises grow continuously throughout their lives, thus the older the tortoise the larger it becomes (Hillestad-Nel in press). The results are presented below in Table 7.7

Site	**Sample size (n)**	**Mean (mm)**
BBF 1	24	7.6
BBF 2	17	7.6
BBF 3	3	7.9
BBF 4	1	7
BBF 7	7	6.28
BBC	10	7.7
BBF 9	5	7.5

Table 7.7: BBF : Mean breadths (mm) of *Chersina angulata* distal humeri.

We would expect that the mean size of the tortoises in the two early sites may have decreased as a result of heavy predation, but this is not the case suggesting that tortoises may have been abundant at this time and that, on average, the tortoises available for collection were larger. Modern populations of *Chersina angulata* are up to 50% larger in length and weight on the drier west coast and on Dassen Island than in the wetter southern Cape regions (Branch 1990).

Unfortunately, the sample sizes are small from the BBF 3 & 4 sites which also may fall within the 'dry' period at BBF, although the mean sizes are comparable to those at BBF 1 & 2.

A lower incidence of forest taxa and a higher grass component in the Cape ecozone during the last 2000 years (Martin 1968; Scholtz 1986) suggests cooler conditions in the southern Cape and although the eastern section of the southern Cape may have been wetter (Deacon & Lancaster 1988; Avery 1982a, 1983) this may not have been the case in the coastal BBF region which generally has a lower rainfall. The mean sizes of tortoises from the post 2000 B.P. sites, BBC & BBF 9, is similar to those from BBF 1 & 2, which may indicate similar precipitation levels during the periods these sites were occupied.

The BBF 7 site (ca. 3100 B.P.) contains the smallest mean sizes of tortoises of all the BBF sites. It is interesting to note that the shellfish from this site were also, on average, the smallest (*cf.* Ch. 6). Assemblages from all the open dune sites at BBF were surrounded by a matrix of generally white to grey aeolian dune site, while the BBF 7 assemblage is encased in a dark, humic matrix. Although it has been suggested that optimum forest conditions in the southern Cape generally prevailed during the warm, moist period from around 6000 -2000 B.P. (Deacon & Lancaster 1988; Avery 1982a, 1983) this may not necessarily have been the case at BBF. Dense vegetation may only have occurred in the BBF area during the latter part of this period, at around 4000-3000 B.P. The small size of the tortoises at BBF 7 may therefore reflect the moist and possibly warm conditions that existed in the BBF area at this time.

When comparing the average size of *C. angulata* from the LSA with the MSA phases at BBC it is evident that the LSA tortoises are smaller (Hillestad-Nel in press). The low numbers of *C. angulata* humeri from the LSA relative to the MSA and the smaller sizes might indicate that tortoise numbers reacted to external pressures, either from heavy exploitation as a human food resource in the LSA (more so than in the MSA) and/or unfavourable climatic conditions (Hillestad-Nel in press). The LSA at BBC and the other BBF sites corresponds with OIS 1 which was very warm and moist. However, the sites postdate 5 ka, with the exception of BBF 1 and BBF 2 (Henshilwood 1995: 99). After 5 ka the climate became cooler and dryer, and similar to the present. Climate cannot be ruled out as a factor influencing tortoise sizes in the LSA, as it could have contributed to either an increase in tortoise size (favourable dry habitat) or a decrease (unfavourable cool habitat) (Hillestad-Nel in press).

The small sample sizes of tortoises from the BBF sites and the general uncertainty about specific palaeoenvironmental conditions during the Holocene, particularly with regard to the microclimate of a particular region, precludes us from making any certain statements about either the BBF climatic changes or about the tortoise predation strategies of BBF people. At this stage, with the available evidence, we are only able to speculate about the relationships between tortoises, prehistoric people and palaeoclimates in the BBF area.

2. Snakes & Lizards

Snake bones were recovered from BBF 2, 3, 4, 6, 9 & BBC. Small quantities of vertebra and ribs were present in the early sites and are most common at BBC; 346 vertebra and 617 ribs were counted from all units at the latter site. Diagnostic snake jaws from the BBC site were submitted to the Herpetology Department at the Iziko-South African Museum but they were unable to positively identify them to species. The most likely candidates are mole snakes, *Pseudaspis cana*, and puff adders, *Bitis arietans,* as these are the largest and most common snakes in the BBF area. Only these two species are recorded in the Byneskranskop 1 units (Schweitzer & Wilson 1982). It is possible that snakes were brought to BBC as food but some may have died naturally at the site. Mole snakes and puff adders are known to occupy abandoned animal burrows (Branch 1990) but the absence of burrows in the LSA stratigraphy at BBC, and the fact that none of the snake bones excavated were still articulated, suggests they were brought to the site as food.

The small number of lizard and frog jaws from BBC & BBF 9 have not been identified; it seems most likely they died there naturally or were brought to the sites by birds or small carnivores .

7.6: Fish

Fish bones were recovered from five of the BBF sites, 1, 2, 6, 7 and BBC. Their preservation at the early open sites, BBF 1 & 2 may be attributed to their small size causing them to be rapidly buried by dune sand, as may have been the case for tortoise bones. Fish bones were sorted to species and MNI's were calculated separately on two sets of body parts by Cedric Poggenpoel at the University of Cape Town. The first calculation was based only on maxillae, premaxillae and dentaries, the second on all other body parts. Although the MNI's derived from 'other' body parts was marginally higher, the differences were slight - 112 fish from all sites/layers by the first method and 136 fish by the second. It is of interest that the sites with the highest MNI's also have the highest species diversity suggesting that at sites with low frequencies, particularly the older sites, a wider range of fish may have been caught than have been identified.

MNI's of fish species by site/unit are presented in Table 7.8. A total of 11 fish species were identified from BBC and the BBF sites. At Nelson Bay Cave more than 14,000 fish were counted with a total of 19 species; 9 species are represented at Die Kelders and 11 at Byneskranskop 1. Table 7.9 shows the fish species that are present or absent at each of the four sites.

BBF 1

Species	Common Name	
Dichistius capensis	galjoen	1
Diplodus hottentotus	zebra fish	1
Diplodus capensis	dassie or blacktail	3
Lithognathus lithognathus	white steenbras	1
Sparodon durbanensis	white musselcracker	3
Site Total		9

BBF 2

Species	Common Name	
Cymatoceps nasutus	black musselcracker	1
Diplodus capensis	dassie or blacktail	2
Seriola lalandi	yellowtail	1
Site Total		4

BBF 6

Species	Common Name	6\2	6\3	6\4	6\7	6\8	6\11
Cymatoceps nasutus	black musselcracker	2	5	2	2	3	3
Diplodus capensis	dassie or blacktail	2					
Petrus rupestris	red steenbras	1					
Sparodon durbanensis	white musselcracker			1			
Spondyliosoma emarginatum	steentjie	2					
Layer Totals		7	5	3	2	3	3

BBF 7

Species	Common Name	7\2	7\3	7\4
Cymatoceps nasutus	black musselcracker			1
Diplodus capensis	dassie	1		
Spondyliosoma emarginatum	steentjie			1
Layer Totals		1		2

BBC

Species	**Common Name**	**BBC L1**	**BBC L2**	**BBC L3**	**BBC L4**	**BBC L5**	**BBC L6**
Chrysoblephus laticeps	red roman				1		
Dichistius capensis	galjoen			1		1	
Cymatoceps nasutus	black musselcracker	1	3	3	27	11	3
Diplodus hottentotus	zebra fish				1		
Diplodus capensis	dassie or blacktail		1		1		
Liza richardsonii	haarder		2		13	3	1
Pomatomus saltatrix	elf		1				
Seriola lalandi	yellowtail				1	1	
Sparodon durbanensis	white musselcracker				1		
Spondyliosoma emarginatum	steentjie		1		14	5	
Layer Totals		1	8	4	59	21	4

Table 7.8: MNI's for fish species from BBF sites

Species	**Common name**	**BBF**	**NBC**	**BNK**	**DK**
Argyrozona argyrozona	carpenter		X	X	
Argyrosomus inodorus/japonicus	kob		X	X	
Clinidae	klipfish		X		
Dichistius capensis	galjoen	X	X	X	X
Chrysoblephus laticeps	red roman	X			
Cymatoceps nasutus	black musselcracker	X	X		X
Diplodus hottentotus	zebra	X	?		
Diplodus capensis	dassie or blacktail	X	X	X	X
Epinephelus andersoni	catface rockcod		X		
Lithognathus mormyrus	sand steenbras		X	X	
Lithognathus lithognathus	white steenbras	X	X	X	X
Liza richardsonii	haarder	X	X	X	
Pachymetopon blochii	hottentot		X	X	X
Petrus rupestris	red steenbras		X		
Pomatomus saltatrix	elf	X	X	X	X
Rhabdosargus globiceps	white stumpnose		X	X	X
Sarpa salpa	strepie		X		
Seriola lalandi	yellowtail	X	X		
Sparodon durbanensis	white musselcracker	X	X		?
Spondyliosoma emarginatum	steentjie	X			

Table 7.9: Presence/ absence table for fish species from BBF, Nelson Bay Cave (NBC), Byneskranskop 1 (BNK) & Die Kelders (DK). (X = present)

The fish species found at all the above sites are *Dichistius capensis, Diplodus capensis, Lithognathus lithognathus,* and *Pomatomus saltatrix*. Those species occurring at three of the four sites include *Cymatoceps nasutus, Pachymetopon blochii, Rhabdosargus globiceps* and possibly *Sparodon durbanensis.* Two species are found only at BBF, namely *Chrysoblephus laticeps* and *Spondyliosoma emarginatum.* The overall pattern suggests that, with some exceptions, the same broad range of species were being caught at all the sites, and that most of the species listed above would have occurred along the section of coast between Die Kelders and Nelson Bay Cave, a distance of some 400 km. Varying environmental conditions, such as the presence of rocky banks or beaches may have affected the availability of some species at the various sites. For example, *Chrysoblephus laticeps* shelter in underwater caves or holes, and are commonly found in the BBF area today because sections of the offshore shelf provide an ideal habitat for this species. Offshore conditions for this fish may not have been similar at the other sites which may explain their presence at BBF and absence elsewhere. The very large fish sample from Nelson Bay Cave may also explain why some of the rarer species such as *Epinephelus andersoni* are reported only at this site.

With the exception of *Pachymetopon blochi*i, most of the species found at Die Kelders and Byneskranskop 1 occur in relatively small numbers. At Die Kelders, *P. blochii* account for 96.4 % of the fish taken (Schweitzer 1979) and 37.4 % at Byneskranskop 1 (Schweitzer & Wilson 1982). Schweitzer (1982:197) suggests that at Die Kelders this species may have been specifically targeted and caught on baited lines. *P. blochii* is absent from the BBF sites and found in relatively small numbers at Nelson Bay Cave, mainly because these areas lack the dense kelp beds found in the south-western Cape which are the preferred habitat of this fish. It seems that although the range of available species at all four sites was similar, the fishing strategies at the south-western Cape sites were different to those of the southern Cape. At the latter sites a wider range of species was caught, either intentionally or opportunistically; this pattern is particularly evident at Nelson Bay Cave, again perhaps because the large fish sample is better able to reflect specific strategies than is the case for most of the BBF sites.

BBC is an exception as relatively larger numbers of fish were identified within the six layers than is the case at the other BBF sites. The black musselcracker, *Cymatoceps nasutus,* is particularly prevalent in the BBC layers L4 & L5 and accounts for 47.5 % of the fish in these two units. In the same layers *Liza richardsonii* makes up 20 % of the total and *Spondyliosoma emarginatum*, 23.8 %; in total these three species account for 91.3 % of the fish found in these two layers and 90 % of all fish at the BBC site. *Cymatoceps nasutus* accounts for 74 % of the fish found in all layers at BBF 6, and the same species occurs at BBF 2. & 7.

In total, *Cymatoceps nasutus* makes up 42 % of all the fish recovered from BBF sites. This apparent pattern of continuous predation of this species at BBF is clearly not the case at Nelson Bay Cave where *Cymatoceps nasutus* accounts for only 2.3 % of the fish recovered from all layers.

The reasons for the predominance of black musselcrackers at BBF are unclear and may be multifactorial. From the available modern evidence it is difficult to gauge how prolific this species may have been in the past in the BBF area. Both deep and shallow rocky reefs occur offshore and provide an ideal habitat for black musselcrackers (*poenskop*) which are a solitary species feeding mainly on red-bait, crabs, sea urchins and other shellfish (van der Elst 1988; Heemstra & Heemstra 2004); presumably similar offshore conditions pertained in this area during most of the Holocene (*cf.* Ch. 2). Although black musselcrackers are very scarce in the BBF area today, Biden (1954) records a number of landings of this fish along the southern Cape coast in the 1940s ; on the other hand Smith (1953) states that nowhere on the South African coast are they found in abundance (also *cf*. van der Elst 1988).

One of the reasons that black musselcrackers may have been specifically targeted at BBF was because of the large amount of fat found in the fishes head. The marine component of hunter gatherer diets throughout the world has elicited much controversy (e.g. Draper 1977; Speth 1990; Dunbar 1991; Malainey *et al* 2001) due to the need to maintain a nutritional balance between protein and fat- or carbohydrate rich sources to avoid the effects of protein poisoning (Noli & Avery 1988). At the coast protein was readily available from shellfish and other marine animals but, at most, could only constitute 50 % of the energy needs of the human body; fat and carbohydrates were therefore essential dietary elements (Noli & Avery 1988; Dunbar 1991). From ethnographic evidence we know that fat is still regarded as a coveted foodstuff by modern hunter gatherers (Marshall 1976; Tanaka 1976; Draper 1977; Lee 1984; Speth 1990; Dunbar 1991; Malainey *et al* 2001). Carbohydrates may have been available from plant foods although in some areas along the coast suitable plants are a scarce resource (Deacon, J. 1984; Liengme 1987). Possible sources of animal fat at the coast are limited mainly to seals and some species of cetacea, but these sources may not always have been readily available or are avoided (Malainey *et al* 2001; Jerardino 2003).

Smith (1953:271) notes that the head of the black musselcracker is often retained by fishermen and regarded as a delicacy, while the coarser body flesh is fed to pigs or dogs. Biden (1954:264) records similar sentiments among fishermen on the Cape south coast.

South coast fishermen value the poenskop *(black musselcracker)* head as a delicious and nourishing food. A party of rock anglers caught a 110-pounder and presented it to some farmers nearby....the *al fresco* dinner consisted of steamed poenskop head....and nine hungry men made an excellent meal of the large, soft, fatty and fleshy flakes of the fish's head.

If black musselcrackers were specifically sought after by the BBF inhabitants then we need to examine how this species may have been caught. Catch records from stone-walled fish traps in the Kleinmond to Cape Agulhas area indicate the presence of *Cymatoceps nasutus* (Avery, G. 1975; also *cf*. Goodwin 1946; Heese, n.d.; van Noten 1974). However, for this type of fish trap to be effective a regular, gently sloping sea bottom with an extensive intertidal zone is essential. These conditions could not be met in the BBF area today with its deep gulleys and irregular seabed topography. Fish traps, still in operation today, are found at Still Bay, 20 km to the east of BBF and at Steenkoolfontein, 18 km to the west but it seems unlikely that large musselcrackers were carried this distance to the BBF sites. The range of non-shoaling fish caught in stone walled traps is usually diverse (Avery,G. 1975) and catches by this method should reflect this diversity. Clearly this is not the case at the BBF sites suggesting that stone fish traps were not the method used here to catch black musselcrackers.

All the fish species found at BBF sites, with the exception of *Liza richardsonii,* could have been caught using a hook and line. Double ended sharpened bone points, found in the Wilton layers at Nelson Bay Cave, have been interpreted as fish gorges (Klein 1973). Goodwin (1946:137) records that a local fisherman in the Gouritz River area found

fishing line made of a shredded wild vine and the hook was a bone tied in the middle and sharpened on each side.

Although no evidence of bone gorges was found at BBF sites, clearly these early fishermen had the technology and skill to hook and land large fish - the black musselcrackers at BBF are a case in point as these fish are known for their strength and fighting ability, and are seldom landed even on modern tackle (van der Elst 1988). Nets may have been used to capture the haarders, *Liza richardsonii,* which often shoal in the shallows at Blombos Beach, but it is highly unlikely that a black musselcracker would have been easily netted.

Based on the available evidence, it seems that the inhabitants of the BBF 6 and BBC sites deliberately sought to catch black musselcrackers, possibly for their fat, and the most likely method used was a line, and hook or bone gorge. As black musselcrackers are seldom found in the southern Cape during summer (Smith 1953: van der Elst 1988) it is more likely they were taken during the winter when they would have been most plentiful. The presence of these fish thus supports a winter occupation for the layers in which the fish occurs.

7.7: Summary

Large mammal bones are poorly preserved in the earlier BBF sites due to exposure and weathering, and are absent at the BBF 6 site. Although preservation of large mammals was excellent at BBC & BBF 9 the relatively small quantities recovered make an overall interpretation difficult. Large bovids are marginally more frequent in the lower layers and small and small-medium bovids occur in all the BBC layers. No large bovids were found at BBF 9 suggesting that smaller animals were taken more frequently in the later period, perhaps due to a decrease in the availability of the larger classes. Small numbers of carnivores, seals and a single hippo are represented at BBC.

The most common small mammal at BBC & BBF 9 is the Cape dune mole-rat, *Bathyergus suillus*; rock hyraxes, *Procavia capensis,* are less common as are scrub hares, *Lepus saxatilis.* Evidence from the burning patterns observable on mandibles, premaxillae and incisors of *Bathyergus suillus* suggest that these animals were brought to BBF sites as food, and were cooked in the same manner that local folk use today. Cut marks are visible on the jaws of two *Procavia capensis* specimens which may indicate skinning, but a larger sample is needed to demonstrate this. As hyraxes have distinct birth seasons and the dental eruption patterns in juveniles are predictable, young specimens found in archaeological sites may be be used as indicators of the season of human occupation. Unfortunately, the juvenile hyrax sample sizes from BBC & BBF 9 are too small to draw any definite conclusions but the evidence suggests that BBC layer L2 was deposited during late summer and the BBF 9 site was occupied in early spring.

The presence of *Coronula diadema* barnacles at BBF 9 points to the presence of whale meat at the site; the most likely candidate is the southern right whale, *Eubalaena australis*, as these are known to calve in the BBF area during winter and early spring. It is possible that whale meat, with barnacles attached, was scavenged from a wash-up and brought to the site. Dolphins occur in the BBC layers and at BBF 9 and are also likely to have been washed up on the rocks or beach and scavenged for their meat.

Two sheep bones from layers 5 & 6 at BBC were submitted for accelerator radiocarbon dating; the layer L5 bone was dated at 1960 ± B.P. and that from layer L6 at 1880 ± 55 B.P. These are the earliest dates for sheep obtained by direct dating in the southern and south-western Cape and suggest a long history for pastoralism in the Riversdale area and probably for the whole southern Cape region. Pottery was recovered from the same stratigraphic layers at BBC as the sheep bone, suggesting that both sheep and pottery were introduced to the Cape at around the same time, ca. 2000 B.P. However, the art of pottery making may not have come to the Cape along the same routes as that of sheep, although at this stage we cannot be sure of the routes by which either may have been introduced. Knowing more about the interaction between Later Stone Age people and Iron

Age agropastoralists in the northern and eastern parts of southern Africa might, in the future, shed further light on this issue.

Although we cannot be sure whether the occupants of the lower BBC units were Khoekhoe or San, it seems that the inaccessibility of the cave and the small quantity of sheep recovered points to occupancy by a small group of hunter gatherers rather than herders. If this was the case, then the sheep in these layers may have been acquired by theft or barter from local Khoekhoe.

Micromammals from the BBC site provide a limited insight into palaeoenvironmental conditions at BBF in the Late Holocene. During the early occupation at the BBC site, ca. 2000 B.P. - 1800 B.P. rank. grassy vegetation seems to be emphasised, but this changes to relatively dry, grassier conditions on a sandy substrate during the period that the middle and upper layers were occupied.

Unlike large mammal bones, tortoise bones are relatively well preserved at a number of the BBF sites, including the earliest ones. Only one species, *Chersina angulata,* was identified at the BBF sites. Contrary to expectations, the highest frequencies of tortoise bones occur in the two earliest sites, BBF 1 & 2. The mean size of tortoises during this period, calculated by measuring the breadth of distal humeri, are among the largest for all the BBF sites. Tortoises favour drier conditions and are both larger and more prolific during such periods. This might explain the higher frequencies and larger mean sizes of the tortoises found in the early and later sites when the area was more arid, and also the small mean sizes of tortoises from BBF 7, ca. 3100 B.P., when optimum forest conditions were likely at BBF.

Eleven species of fish are recorded, but most occur in small quantities. Exceptions are the black musselcracker, *Cymatoceps nasutus*, haarders, *Liza richardsonii* and steentjies, *Spondyliosoma emerginatum.* The black musselcracker is the most common fish found at BBF and accounts for 42 % of fish found at all sites. The reasons for the predominance of this species at BBF are probably multifactorial and include suitable offshore conditions and therefore availability, the highly nutritious fat found in the fishes head and the ability of the locals to catch them, probably using hand lines and gorges or hooks. With the exception of *Liza richardsonii,* which may have been netted, all the other species of fish found at BBF sites could have been caught using handlines. Stone walled fish traps are unlikely to have been used in the BBF area as the coastal topography here is unsuited to this method; however, it is possible that the same groups of people who visited BBF may, at other times, have operated the fish traps which are still extant in the Still Bay and Steenkoolfontein areas.

CHAPTER 8

CULTURAL ARTEFACTS

8.1: Introduction.

The cultural artefacts recovered from BBF sites include stone and bone tools, decorative items in bone and shell, and pottery. By comparing these artefacts with those recovered from archaeological sites in the southern, south-western and eastern Cape we are able to make some predictions as to the cultural changes which occurred in these regions over space and time, although not necessarily explain why these changes occurred. It seems likely there was an extensive network of social contact between hunter gatherer groups living in the Cape during the Holocene which resulted in a broad Pan-San cognitive system operating throughout the region and beyond (Deacon, J. 1984a, b, 1990; Deacon & Deacon 1999). One of the ways in which this interlinking of San cultural systems has been demonstrated is by comparing San rock art from a broad spectrum of sites, ranging from Natal to the western Cape. Distinct numerical emphases of certain subjects, over an extensive geographical area, suggests that a widely held cognitive system and social convention, rather than idiosyncratic choice, determined the species of animals painted (Vinnicombe 1976; Lewis Williams 1982, 1987; Lewis-Williams & Dowson 1989; Lewis-Williams & Pearce 2004).

This does not imply that Pan-San cognitive systems were static during the Holocene but rather that, over time and space, a multitude of interactive causes triggered changes within the system which were disseminated through an extensive network of interaction. Changes that occur within a broad social system are not necessarily synchronic nor gradual, there may also be long periods of relative stasis followed by rapid change.

A broad trajectory of industrial change is similar in the lithics from a number of sites in the Cape Folded Belt mountains and along the coastal regions of the Cape Province. H.J. Deacon (1976) attributes this relative homogeneity to social contact. He rejects earlier models which favoured cultural change brought about by the arrival of successive 'waves' of new people and favours diffusion, possibly along linguistic pathways, which would have been tempered through time by local adaptive responses to environmental and ecological conditions. An overall pattern of grading within assemblages, rather than sharp contrasts, was also noticed suggesting a long trajectory of locally induced change. Inter-site variability in subsistence modes and technology may have been linked to adaptive strategies designed to take advantage of locally available resources. Varying frequencies of formal tool types could also be a function of the particular tasks carried out a site, rather than necessarily a marker of 'cultural' or social affinities (Deacon, H.J 1976; Deacon, J. 1984a, 1990; Deacon & Deacon 1999).

Janette Deacon (1978, 1984a) tested the assumed correlation between environmental change, stone artefact manufacture and subsistence strategies based on the results from three sites in the southern Cape, namely Nelson Bay Cave, Kangkara and Boomplaas. Her results showed there was a broad correlation between environmental and subsistence change but, contrary to H.J. Deacon's (1976) hypothesis, macroevolutionary changes in stone artefacts at these three sites cut across both environmental boundaries and subsistence strategies. However, at all three sites the timing of the industrial changes from Robberg to Albany to Wilton are similar, which suggests diffusion/ borrowing due to intergroup contact (Deacon & Deacon 1999; Mitchell 2002). Stone artefact traditions could therefore best be described in terms of a model of punctuated equilibria in which for long periods there was cultural continuity followed by a period of rapid change (Deacon, J. 1984a, 1990; Deacon & Deacon 1999). At the microevolutionary level, though, distinctions can be made between lithic traditions from the three sites Nelson Bay Cave, Boomplaas and Kangkara. The frequencies of certain tool types and preferred raw materials are site specific and may relate to individual choice, availability of materials and activity variation (Deacon, J. 1978, 1984a).

A band of hunter-gatherers moving in a seasonal round may have utilised tool-kits best suited to the tasks carried out within each environment. For instance, in the western Cape adzes are associated with inland sites and were possibly used for the manufacture of digging sticks, whereas at coastal sites, where marine resources may have replaced plant foods, adzes are absent or infrequent (Parkington 1972, 1976, 1987, 1991; Parkington *et al* 1988; Orton 2002). However, assigning assemblages from different sites to an individual hunter gatherer band is not yet within our capabilities and to test this model of tool selection, or seasonal transhumance, we are reduced to piecing together circumstantial archaeological, bioarchaeological and chemical evidence (cf. Deacon H.J. 1969, 1976; Parkington 1972; Buchanan *et al* 1978; Sealy 1986, 1989; Sealy & van der Merwe 1985; Parkington *et al* 1988; Parkington 1991; Jerardino 1998, 2003; Henshilwood *et al* 2001a; Orton 2002; Sadr *et al* 2003; Sealy *et al* 2004).

Inter- and intra-site comparisons of stone tool assemblages have yielded useful information on the broad trajectory of industrial changes within the Cape region and have provided some interesting insights into the factors which may have motivated these changes (Deacon, H.J. 1976; Deacon, J, 1984a, b, 1990; Inskeep 1987; Orton 2002; Jerardino 2003; Sealy *et al* 2004). Archaeologists are faced with the task of interpreting past social systems based on the sparse information contained in excavated assemblages and it is therefore understandable that most attempt to extract as much information as possible from the data to hand (Henshilwood 1990; Orton 2002). This is particularly true in the case of lithic assemblages where often every dimension of each artefact is measured and recorded. In the past the resulting site reports contain extensive charts and tables comparing, for example, scraper or adze sizes or shapes from a range of sites and regions. Rarely, was there an accompanying interpretation for the reasons which motivated the changes in the sizes or shapes of tools but rather the data was presented as a set of facts to be interpreted by the reader. Perhaps, this is not surprising as the functions of some of the tools are, in any case, poorly understood, and therefore attempting to explain the minute variations in the length or breadths of these same tools is complex.

Recent approaches now seek to address the issue of understanding the use of the tools and their likely function, not simply their dimensions (e.g. Wurz *et al* 2003; Lombard 2005, 2007; Minichillo 2005; Soriano *et al* 2007; Villa *et al* submitted) . The shape and size of a particular tool, or even its function, may be related to a multiplicity of factors which may include, among others, cultural norms operating at the time; the choice of raw materials available; the specific function for which it was intended to be used; re-working of a worn out tool; the location and age of the site and to some measure the idiosyncrasies of its maker (Lombard 2005, 2006 a,b, 2007a,b; Villa *et al* submitted. This implies that even though broad trajectories of change in the size and shape of scrapers, for example at the Wilton site (Deacon 1972), can be mapped over time it may not, by extension, hold true that the reasons motivating these changes at one site will hold true for other sites in similar or different locations (Deacon & Deacon 1999). Remnants of past social systems lie in the cultural artefacts we recover from archaeological sites, and from the collective data at our disposal we can recognise that a social and material cognitive system operated over a wide geographical area in southern Africa during the Holocene and before (Henshilwood 2008; in press). In order to interpret the reasons for the observed changes in cultural artefacts we would ideally need to examine a suite of sites of similar age situated within a circumscribed geographical area (Henshilwood 2008).

The objectives of the study of cultural artefacts from BBF sites were to examine synchronic and diachronic changes observable within a defined and limited region. However, although the BBF sites are spatially linked their temporal differences provide us only with a tantalising glimpse of the social and cultural systems which were in operation here over the past 7000 years and in the case of BBC, into the more distant past.

The Lithic Artefacts

8.2: Classification Scheme and inventory

Lithic artefacts recovered from BBF sites were classified according to the scheme devised by J. Deacon (1984a:370-409) which is 'based on the reduction sequence from raw material to formal tool'. All the recovered stone was initially sorted into three classes, namely Unmodified, Modified/Utilised and Retouched . Each artefact within a class was then classified according to category and raw material. In total, over 14,000 pieces of artefactual stone were recovered from the BBF sites but, as is usual for southern Cape coastal sites, the frequencies of diagnostic artefacts are low, for example at Die Kelders, Byneskranskop 1, Vaalkrans Shelter located in De Hoop Nature Reserve (Henshilwood & van Niekerk 2006) and Nelson Bay Cave (*cf*. Deacon, J. 1978; Schweitzer 1979; Schweitzer & Wilson 1982; Inskeep 1987). Similar observations were made at Klasies River Mouth Caves 1 & 5 (Singer & Wymer 1969), Storms River Mouth middens (Deacon, H.J 1970), Hoffman's Cave (Klein, unpublished) and Bonteberg Shelter (Maggs & Speed 1967) where there is a near absence of formal tools. On the south-western Cape coast low frequencies of formal tools are also reported at coastal sites, especially after 2000 B.P. (Orton 2002; Jerardino 2003; Sealy *et al* 2004).

Klein (1973) interpreted this pattern as being either due to sampling error or because formal tools were not particularly important in the exploitation of marine resources. In the light of the greater number of coastal sites now excavated (Schweitzer & Wilson 1982; Inskeep 1987; Jerardino 1998, 2003; Orton 2002; Sadr *et al* 2003; Sealy *et al* 2004; Henshilwood & van Niekerk 2006), sampling error seems an unlikely explanation. Marine resources are likely to have been only part of a seasonal round of subsistence strategies (Parkington 2001) suggesting that the same groups of people were utilising inland resources as well although this may not always have been the case (Sealy *et al* 1986, 2000). The occupants of coastal sites were therefore undoubtedly aware of the range of formal tools found at inland sites, and possibly proficient in their manufacture. A more likely explanation for the generally low incidence of formal tools at coastal sites is that the range of activities carried out in a coastal environment were different to those of the inland or intermontane regions and did not, therefore, require the same tools. Also, the economic activities of herders and hunter gatherers were different, even at similar locations (Sadr *et al* 2003), and hence the tools used were different (Sealy *et al* 2004).

An example of a coastal site with a relatively high formal tool component is BBF 4 site where formal tools account for 8.5 % of the lithics. This figure suggests that the magnitude of activities requiring retouched tools at this site was different to that at other BBF sites (Table 8.1). The high percentages reflected for retouched artefacts at BBF 6\12, 7\2 & 7\3, are not considered statistically significant due to the small frequencies of artefacts in these units. BBF 3 & 7\4 are interesting as the ratio of retouched artefacts to the site total is high, suggesting that either there was minimal knapping at the sites and that the formal artefacts here were manufactured elsewhere, or that the site sampling strategy was inadequate.

BBF Site/unit	Unmodified n	Unmodified %	Utilised/ Modified n	Utilised/ Modified %	Retouched n	Retouched %	Site/unit Total n	Site/unit Total %	AD/g %
1	995	94.0	13	1.2	50	4.7	1058	7.4	2.5
2	588	96.2	15	2.4	8	1.3	611	4.3	0.5
3	57	76.0	9	12.0	9	12.0	75	0.5	0.1
4	3482	90.8	30	0.8	325	8.5	3837	26.7	3.6
5	168	82.8	27	13.3	8	3.9	203	1.4	0.4
6\2	2	100	0	0	0	0	2	0	0
6\12	5	71.4	0	0	2	28.6	7	0	0.4
7\1	787	93.4	17	2.0	39	4.6	843	5.9	2.4
7\2	11	73.3	0	0	4	26.7	15	0.1	0.2
7\3	11	73.3	2	13.3	2	13.3	15	0.1	0.1
7\4	27	69.2	0	0	12	30.8	39	0.3	0.2
BBC L1	486	99.2	2	0.4	2	0.4	490	3.4	7.2
BBC L2	1552	99.6	4	0.3	2	0.1	1558	10.8	6.7
BBC L3	1017	100	0	0	0	0	1017	7.1	66.9
BBC L4	552	94.4	29	4.9	4	0.7	585	4.1	0.8
BBC L5	109	94.8	4	3.5	2	1.7	115	0.8	0.8
BBC L6	68	100	0	0	0	0	68	0.5	0.9
9	3801	99.6	14	0.4	3	0.1	3818	26.7	3.6
Site Total	13718	95.6	166	1.2	472	3.3	14356		

Table 8.1: BBF : Inventory of stone artefact classes

(AD/g % = density of stone (n) relative to total mass (g) per site)

8.3: Raw materials

The range of raw materials within each major artefact class are listed below (Table 8.2).

Site	Unmodified				Utilised/Modified			Retouched			
	Q	S	Qt	O	S	Qt	O	Q	S	Qt	O
	%	%	%	%	%	%	%	%	%	%	%
1	1.1	76.6	22.3	0	76.9	23.1	0	0	100	0	0
2	46.7	11.7	40.4	1.2	26.7	73.3	0	12.5	87.5	0	0
3	1.1	19.2	73.4	6.3	12.5	87.5	0	11.1	88.9	0	0
4	0.4	77.6	18.9	3.1	53.3	43.3	3.3	0.6	97.2	0	2.2
5	4.7	34.3	58.7	2.3	0	100	0	0	100	0	0

6\2	0	0	100	0	0	0	0	0	0	0	0
6\12	60	20	20	0	0	0	0	50	50	0	0
7\1	9.1	20.3	66.1	4.5	52.9	35.3	0	12.8	87.2	0	0
7\2	18.2	36.4	45.5	0	52.9	35.3	0	12.8	87.2	0	0
7\3	0	36.4	45.5	18.2	0	100	0	0	100	0	0
7\4	3.6	25	67.9	3.6	0	0	0	0	83.3	0	16.7
BBC L1	8.6	35.7	55.3	0.4	0	100	0	0	0	100	0
BBC L2	15.8	19.1	65.1	0	0	100	0	0	100	0	0
BBC L3	0.3	0	99.7	0	0	0	0	0	0	0	0
BBC L4	47.7	21.9	30.4	0	0	0	0	25	50	25	0
BBC L5	33.6	19.1	46.4	0.9	0	100	0	50	50	0	0
BBC L6	85.8	0	13.2	0	0	100	0	0	0	0	0
9	73.4	0.7	25.8	0.2	0	0	0	100	0	0	0
Total %	22.5	24.8	49	3.7	20.2	78.4	1.4	17.5	66.3	8.3	7.9

Table 8.2: Frequencies by site/unit of raw materials in the major artefact classes

Raw Materials: Q = quartz, S = silcrete, Qt = quartzite, O = other (c.c.s & limestone)

Quartz

In the unmodified class quartz is virtually absent in the early sites which predate ca. 3200 B.P. One exception is BBF 2 where quartz is the most common raw material in this class. The high percentage of quartz in 6\12 is not statistically significant due to the low frequencies of unmodified artefacts recovered. Unit 7\1 shows a significant trend towards an increase in the presence of quartz in later sites (9.1 %); only small quantities of quartz are present in the units 7\2 -7\4.

The highest percentages of unmodified quartz artefacts are found in sites post-dating 2000 B.P., especially the lower layers at BBC and BBF 9; BBC layer L3 is the one exception with a high unmodified artefact count but low percentage of quartz (0.3 %). Despite the two exceptions, BBF 2 and BBC L3, the overall trend shows a minimal presence of unmodified quartz in the early sites followed by a rapid increase in the use of this raw material after 2000 B.P. A similar trend is reported from some post 2000 B.P. sites on the south-western Cape coast (Orton 2002; Sadr *et al* 2003; Sealy *et al* 2004) but also with a high percentage of quartz, mostly debitage and a few scrapers, from sites falling with the 3000 – 2000 B.P. range (Jerardino 2003). At the Vaalkrans shelter located in the De Hoop Nature Reserve, southern Cape the quartz pieces from levels dating to c. 1680 AD are unmodified (Henshilwood & van Niekerk 2006).

Quartz is absent in the modified/utilised category at all the BBF sites. Retouched quartz is virtually absent in the BBF 1 - 5 sites with only two artefacts recorded. Only chunks and flakes occur in quartz at BBF 2 which suggests that quartz flakes were being struck for a specific purpose at this site; a similar activity may not have occurred during the occupation of the other early sites.

Silcrete

The frequency trend for silcrete in the unmodified class is almost the reverse to that of quartz. Highest percentages of silcrete occur in the early BBF sites which predate ca. 3000 B.P. and the lowest in the later BBC & BBF 9 sites. Silcrete is particularly dominant in the unmodified class at BBF 1 & 4 accounting for 76.6 % and 77.6 % respectively. BBF 2 is the one exception among the earlier sites with a high frequency of quartz and relatively low frequency of silcrete. Silcrete features strongly in comparison to quartz in all the BBF 7 layers.

In the unmodified class the use of silcrete varies in the post 2000 B.P. sites/units; it is virtually absent in the units BBC L3, BBC L6 and at BBF 9, but is present in varying quantities in other units. Of interest is the increased presence of unmodified silcrete is some of the upper BBC layers, particularly in the youngest layer, BBF 1, dating to 290 ± 20 B.P.

Silcrete artefacts in the modified\utilised class are only found in sites pre-dating 2000 B.P. and are completely absent in the BBC layers and at BBF 9. Silcrete tools with formal retouch occur in very low frequencies in the post 2000 B.P. sites - a total of 5 at BBC & BBF 9 compared to a total of 452 in the earlier BBF sites.

Quartzite

The frequency of quartzite in the unmodified class varies at BBF but overall is a common raw material found at all sites/units. There is no particular pattern to its use in the pre- and post 2000 B.P. periods. Quartzite is readily available in the BBF area which may, in part, account for its regular use at all the sites.

Quartzite was modified or utilised at some of the pre-2000 B.P. sites, particularly in the earlier ones, BBF 1-5., although the frequency of artefacts in this class varies between these sites. Limited quantities of utilised/modified quartzite were recovered from the BBF 7 layers. In the post 2000 B.P. period quartzite is the only raw material used for utilised/modified artefacts. Formally retouched artefacts are rare in quartzite with only two being recorded for all the BBF sites, and both are from BBC.

Other Lithic Raw Materials

The 'other' class of raw materials include shale, hornfels, manganese oxide and crysto-cryptalline substances (CCS) such as chalcedony and agate. In all three artefact classes these substances are generally very rare but they do occur in higher frequencies in the pre 2000 B.P. sites. BBF 7 is exceptional in that 'other' raw materials are found in all four units. It is the only site containing artefacts in these raw materials which show evidence of modification/utilisation, and of formal retouch.

Sources of Raw Materials

Silcrete

Numerous exposures of silcrete occur both in quarries and as natural outcrops between Riversdale and Albertinia, around 30 km to the north and north-east of BBF (Bosazza 1939, Frankel 1952, Summerfield 1981; Henshilwood *et al* 2001a; Johnson *et al* 2005). Silcrete occurs predominantly as cappings up to 5 m in thickness on dissected erosion surfaces but is also found outcropping along valley sides. The bedrock in this area is predominantly Bokkeveld Series shale, much of the shale being weathered to a white locally ferruginous clay often to a depth of several metres (Johnson *et al* 2005). A Post Mio/Pliocene to Present age is proposed for the Cape coastal zone silcretes (Summerfield 1981;1983).

Three types of silcrete have been noted in the area. A hard, fine grained massive grey and a less hard, white or cream silcrete. Both of these commonly occur in clay. The grey silcrete fractures sub-conchoidally and the less indurated material fractures irregularly and/or angularly producing rectangular or cubic blocks when shattered. Nodular or glaebular silcrete is generally present on the surface of flat topped hills and does not occur in clay. The third type of silcrete is a conglomerate consisting of angular silcrete pebbles (Frankel 1952; Summerfield 1981).

Ochre

Concentrations of red and yellow (impure) ochre occur within the lenses of ferruginous clay which overly the Bokkeveld Series shales in the area between Riversdale and Albertinia (Visser 1937; Bosazza 1939; Summerfield 1981). Ochre was first commercially mined near Albertinia, c. 50 km east of BBF, in 1925 by W.R van As (Frankel 1952).and these mines are still operating, in addition to quartzite and kaolin extraction

Quartz

Quartz veins occur in the Table Mountain Group sandstones (TMS) which outcrop on the coast below BBF. At Skurwebaai there is evidence of chipping and crushing of quartz veins suggesting the mineral was mined here in the past. Rounded quartz pebbles can be found on Blombos Beach and in the inter-tidal pools. Vein quartz pebbles, derived from the quartz veins in the Bokkeveld shale, are found associated with silcrete outcrops to the east of Riversdale (Frankel 1952).

Quartzite

Smoothed and rounded quartzite pebbles and quartzite angular blocks are found in abundance in the areas where TMS outcrops below BBF and on Blombos beach.

Manganese Oxide

Manganese oxide nodules are formed by precipitation on the ocean floor. Small quantities were recovered from BBF 4; nodules may occur naturally in the low dune areas of BBF and at the coast.

8.4: Unmodified Artefacts

Unmodified artefacts, also known as 'waste' artefacts or manuports, are those that show no evidence of having been used. The term 'waste' has deliberately not been applied here as Schweitzer & Wilson (1982:28) point out that artefacts in this category may have been used but the evidence is not readily detectable, particularly on quartz and quartzite. Detailed descriptions are not provided for each category of unmodified artefacts below as these are fully described elsewhere (*cf*. Deacon, H.J. 1976; Schweitzer 1979; Schweitzer & Wilson 1982; Deacon, J. 1984a, 1990; Inskeep 1987). An inventory of classes of unmodified lithic artefacts is contained in Table 8.4; Table 8.5 reflects raw materials by artefact categories and site/unit.

Chips & Chunks

Chips and chunks are of irregular shape with no obvious bulbar or platform scar, nor obvious potential use. They represent the coarse debris that results when raw material is worked. Chips are <10 mm in size, chunks are 10 mm>.

These two categories account for 78.1 % of the class total. Silcrete chips and chunks dominate at the early sites, BBF 1, 3 & 4, but occur in lower frequencies at BBF 7 and are least common at BBC & BBF 9. With the exception of BBF 4, quartz chips and chunks are present in small quantities in the early sites but increase in frequency at BBF 7 and are most common in the post 2000 B.P. sites, particularly BBC layers L4, L5, L6 & BBF 9. Quartzite chunks are more frequent than quartzite chips at all the BBF sites which may relate to the coarseness of the raw material. Quartz, on the other hand, is brittle and shatters readily producing large numbers of chips and flakes; as a result quartz chips outnumber chunks at virtually all the BBF sites.

Flakes, Blades & Bladelets

The flakes in this class are unmodified with no visible lateral damage that can be ascribed to usage or retouch and are generally irregular in shape but have a discernible platform, bulbar scar and/or recognisable dorsal or ventral surface. Silcrete flakes dominate the early assemblages at BBF 1, 3 & 4; occur in similar quantities to quartzite at BBF 7, and in the later sites quartzite and quartz flakes have the highest frequencies, indicating a decrease in the use of silcrete for flake manufacture over time. The same trend is observable for the chips and chunks categories.

Blades are parallel-sided flakes with a length greater than twice their maximum width and are 15 mm > in length; bladelets are <15 mm in length. All the blades and bladelets recovered from the pre 2000 B.P. sites are in silcrete and many of these blanks were probably struck with the intention of retouching them for use as scrapers, backed blades, backed scrapers or borers.

Cores

Cores were separated into six categories, namely radial, blade, irregular, bipolar, single platform and cobble. Radial cores show evidence that blades were struck from the circumference of a discoidal core towards into centre and are found in early and late BBF sites in silcrete, quartz and quartzite. Blade cores show evidence of parallel-sided flake scars at least twice as long as they are wide; they occur only at BBF 1 & 4 and are in silcrete. Irregular cores do not fall within any core sub-class, are the most frequent at BBF sites and occur in quartz, quartzite, silcrete and 'other' materials. Bipolar cores show evidence of crushing at both ends and were probably placed on an anvil prior to a blow being struck to the top of the piece; some may have been wrapped in leather prior to striking. They are most commonly found in quartz suggesting this technique was applied mainly to brittle raw materials to obtain numerous small flakes, for example at BBF 4 & 9. Single platform cores are found only in the early sites, BBF 1, 2, 4 & 5 in quartz and silcrete. Flakes struck directly from an unprepared cobble frequently show evidence of cortex on one surface. Cobble cores are mainly in quartz and found only at BBF 2.

Silcrete cores predominate in the pre 2000 B.P. sites but are less frequent in later sites where quartz cores have the highest frequency, for example in the lower BBC layers and at BBF 9.

Ochre

Ochre was classified according to three categories; pencils, chunks and ground. Ochre pencils are elongate in shape and one end has one or more flat abraded surfaces usually forming a point; chunks vary in shape and size but show no sign of having been worked; ochre pieces in the 'ground' category are striated through rubbing or working but assume no particular shape.

Apart from BBF 2 & 6, ochre is found at all the BBF sites. It is less common in the earlier sites BBF 1, 3, 4 & 5 but occurs in greater frequencies at BBF 7 & BBC. Details of the recovered ochre are listed in Table 8.3.

BBF Site	Mass g	Pencils n	Chunks n	Ground pieces n

1	20.3	-	14	-
3	8.2	-	5	-
4	38.9	1	21	1
5	7.2	-	3	-
7	74.6	1	43	1
BBC	234.9	-	182	15
9	1.6	-	2	-
Total	385.7	2	270	17

Table 8.3: Inventory of ochre from BBF sites

Class> / Site/ unit	Chips	Chunks	Flakes	Blades 15mm>	B/lets <15mm	Cores: Radial	Cores: Blade	Cores: Irreg.	Cores: Bipolar	Cores: SP	Cores: Cobble	Site/unit Total n
1	445	218	208	47	63		3	6	0	5	0	995
2	140	201	221	1	2			6		7	10	588
3.		18	33	1	2			2	1			57
4	1153	1223	848		208	4	5	37	3	1		3482
5	18	82	37	8	2			11	2	8		168
6\2		2										2
6\12		2	1		1				1			5
7\1	65	479	228		2	3		6	4			787
7\2	2	6	2						1			11
7\3		6	5									11
7\4		17	10									27
BBC L1	223	194	64	2				1	2			486
BBC L2	1017	406	118		6			3	2			1552
BBC L3	637	308	71					1				1017
BBC L4	159	253	124		4	2		10	1			552
BBC L5	17	54	34			1		2	1			109

BBC L6	49	14	5									68
9	2345	963	492		1							3801
Total	6270	4446	2501	59	291		18	85	18	21	10	13718
%	45.7	32.4	18.2	0.43	2.1		0.13	0.62	0.13	0.15	0.07	

Table 8.4: Inventory of classes of unmodified lithic artefacts

(Note: B/lets = Bladelets; Irreg = Irregular; SP = Single platform;

AD/g % = density of stone (n) relative to total mass (g) per site)

Site/ unit	Raw material	Chips	Chunks	Flakes	Blades	Bladelets	Cores
	%	%	%	%	%	%	%
1	Q	1.6	1.4	0.5	-	-	-
1	S	91	46.8	65.4	100	100	54.5
1	Qt	7.4	51.8	34.1	-	-	45.5
2	Q	69.3	43.8	39.8	-	-	24
2	S	5.7	9	18.1	100	100	4
2	Qt	25	47.3	42.1	-	-	64
2	O	-	1	1.4	-	-	8
3	Q	-	1.9	-	-	-	-
3	S	94.5	58	79.6	-	100	76.7
3	Qt	4.9	34.9	18.3	-	-	16.3
3	O	0.2	6.8	1.3	-	1.5	4.7
4	Q	0.3	0.3	0.7	-	-	2.3
4	S	94.5	58	79.6	-	100	76.7
4	Qt	4.9	34.9	18.3	-	-	16.3
4	O	0.2	6.8	1.3	-	1	4.7
5	Q	11.1	4.8	-	-	-	9.1
5	S	44.4	31.3	35.9	100	100	4.5
5	Qt	44.4	62.7	59	-	-	81.8
5	O	-	1.2	5.1	-	-	4.5

6\2	Qt	-	100	-	-	-	-
6\12	S	-	-	-	-	100	-
6\12	O	-	50	-	-	-	-
7\1	Q	26.2	7.1	8.8	-	-	30
7\1	S	18.5	15.4	30.7	-	50	0
7\1	Qt	43.1	74.1	56.6	-	-	10
7\1	O	12.3	3.3	4	-	50	40
7\2	Q	100	-	-	-	-	-
7\2	S	-	33.3	50	-	-	100
7\2	Qt	-	66.7	50	-	-	-
7\3	S	-	33.3	40	-	-	-
7\3	Qt	-	50	40	-	-	-
7\3	O	-	16.7	20	-	-	-

Table 8.5: Unmodified class lithics: Raw material by artefact categories and site /unit

(continued on next page)

(Table 8.5: Continued from previous page)

Site/ unit	**Raw material**	**Chips**	**Chunks**	**Flakes**	**Blades**	**Bladelets**	**Cores**
	%	**%**	**%**	**%**	**%**	**%**	**%**
7\4	Q	-	5.9	-	-	-	-
7\4	S	-	23.5	30	-	-	-
7\4	Qt	-	70.6	70	-	-	-
7\4	O	-	5.9	-	-	-	-
BBC L1	Q	15.2	2.6	4.7	-	-	-
BBC L1	S	40.4	30.4	32.8	100	-	66.6
BBC L1	Qt	44.4	67	62.5	-	-	33.3
BBC L1	O	-	1	-	-	-	-
BBC L2	Q	22.2	4.2	1.7	-	-	-
BBC L2	S	15.1	21.7	38.1	-	100	80

BBC L2	Qt	62.6	74.1	60.2	-	-	20
BBC L3	Q	-	1	-	-	-	-
BBC L3	Qt	100	99	100	-	-	100
BBC L4	Q	71.1	31.2	50	-	25	81.8
BBC L4	S	17	23.7	25.8	-	50	-
BBC L4	Qt	11.9	45.1	24.2	-	25	18.2
BBC L5	Q	100	7.4	38.2	-	-	66.6
BBC L5	S	-	20.4	26.5	-	-	33.3
BBC L5	Qt	-	72.2	35.3	-	-	-
BBC L5	O	-	1.9	-	-	-	-
BBC L6	Q	93.9	57.1	100	-	-	-
BBC L6	Qt	6.1	42.9	-	-	-	-
9	Q	81.8	62.8	55.3	-	-	59.1
9	S	0.1	0.8	3.5	-	0	-
9	Qt	18	36.3	41.3	-	100	40.9
9	O	0	0.2	0.6	-	-	4.5

Table 8.5: (Continued) : Unmodified class lithics: Raw material by artefact categories and site /unit.

Raw Materials: Q = quartz, S = silcrete, Qt = Quartzite, O = other (c.c.s & limestone)

8.5 Utilised/Modified Class

Artefacts falling within the utilised/modified class show evidence of use damage, or of modification of their shape for, or through use. Utilised/modified stone artefacts account for 1.1 % of the total of lithic artefacts recovered from all BBF sites. The low frequencies found in most categories of utilised/modified tools make it difficult to analyse trends in raw material use and tool type over time, although there are some clear differences between sites pre- and post-dating 2000 B.P. and these are discussed below. Table 8.6 is an inventory of categories of utilised/modified lithic artefacts; Table 8.7 lists the raw materials by artefact categories and site/unit for utilised/modified artefacts.

Flakes, blades and bladelets

Utilised flakes, blades or bladelets were recovered only from sites pre-dating 2000 B.P., and with a few minor exceptions in quartzite, the predominant raw material is silcrete. Schweitzer (1979:177) suggested that some untrimmed flakes in the unmodified category at Die Kelders may have been used, possibly mounted in mastic, but no utilisation damage was visible. Most of the flakes, blades and bladelets from BBF sites were examined through a microscope for edge or utilisation damage, but as the data in Table 8.6 shows, the numbers of these artefacts that appear to have been used are small. The intended purpose of the large numbers of unmodified flakes, blades and bladelets manufactured at BBF sites is therefore unclear. A small percentage (18 %) were utilised, modified or retouched, but the majority are unmodified. At BBF 9 almost 500 quartz flakes were counted but none showed signs of use or retouch.

However, two chunks of mastic were recovered from the western side of the OH hearth suggesting that some of these flakes may have been mounted as armatures. An example of a small mastic-mounted quartz flake was found in Layer 12 at Die Kelders dated at 1960 ± 85 B.P. (Schweitzer 1979:177). In two watercolours painted by F. Steeb in 1813, 'Bushmen' are depicted near Graaff Reinet, Eastern Cape Province, carrying arrows which have triangular tips (iron?) mounted in mastic (Cape Archives A1415 (73)). It therefore seems probable this practice persisted throughout the Late Holocene.

Pièce esquille (Scaled Pieces)

Scaled pieces show evidence of crushing or chipping along the striking platform, possibly as a result of being used on wood (Deacon, J, 1984a:379) although Schweitzer (1982:37) suggests that scaled pieces may be worked-out bladelet cores which have their edges crushed during attempts at removing further bladelets (also *cf*. Inskeep 1987:53).

Scaled pieces in silcrete only occur in the earlier BBF sites but examples in quartzite are found in small quantities throughout the BBF occupation sequence.

Hammerstones, Grindstones and Combinations

Hammerstones from the BBF sites are generally water-worn pebbles or cobbles which show pitting or bruising consistent with use as a hammer. A total of 38 were recovered from 9 BBF sites/units and all are quartzite. Hammerstones are a regular feature of coastal exploitation patterns and may, among other applications, have been used for processing shellfish, breaking up pigment nodules or in the production of quartz waste (e.g. at BBF 9) (Deacon, H.J. 1976; Avery 1976; Schweitzer 1979; Schweitzer & Wilson 1982; Inskeep 1987; Orton 2002).The highest number of hammerstones come from the BBF 5 site (29 %) and lends support to the proposal made in Chapters 5 & 6 that the site was primarily used for processing *Turbo* and *S. tabularis.* Twelve lower grindstones (36 % of total BBF grindstones) came from BBF 5 and show evidence of scarring and pitting consistent with use as anvils; these may have been collected from surrounding sites.

Lower grindstones bear smoothed grooves or concave surfaces as a result of being used as a fixed grinding surface. Rubbers, or upper grindstones, are smaller stones which can be hand-held and have one or more facetted surfaces caused by use during rubbing; 38 % of the BBF upper grindstones were stained with ochre as were 43 % of the lower grindstones. Combination tools include hammer/grindstones and a single grindstone/core. With the exception of BBF 6 hammerstones and grindstones are found at all the BBF sites.

Fig. 8.1. Quartzite grindstone in situ. The ground surfaces of the grindstones on this site were turned face down.

Flaked cobbles are stones that have been opportunistically used, perhaps once or twice, as hammers or anvils resulting in abrasion marks, the removal of surface cortex or of a few flakes. As such, they cannot be classified within the above categories and are infrequent at BBF sites.

All the hammerstones, upper and lower grindstones, combination hammer/grindstones and a grindstone/core from BBF are in quartzite.

Site/ Unit	Flakes	Blades	B/lets	PE	HS	Grind-stones	Comb-ination	F.C	Total

						Upper	Lower	H/G	G/C		
1	4	4	3	1	-	-	1	-	-	-	13
2	-	2	1	1	5	2	4	-	-	-	15.
3	-	-	1	1	1	1	2	2	-	-	8
4	12	2	1	5	2	4	1	-	-	3	30
5	-	-	-	-	11	1	12	1	1	1	27
7\1	6	-	4	2	1	-	2	2	-	-	17
7\3	-	-	-	-	-	-	2	-	-	-	2
BBC L1	-	-	-	1	-	-	1	-	-	-	2
BBC L2	-	-	-	-	3	-	-	1	-	-	4
BBC L4	-	-	-	6	6	2	5	10	-	-	29
BBC L5	-	-	-	1	2	-	-	1	-	-	4
9	-	-	-	4	7	-	3	-	-	-	14
Total	22	8	10	22	38	10	17	15	1	4	165

Table 8.6: Inventory of categories of modified/utilised lithic artefacts

(Note: B/lets = bladelets; PE = piece esquilles; HS = hammerstones; H/G = hammer/grindstone; G/C = grindstone/core; FC = flaked cobble)

Site/ unit	**Raw Mat.**	**Flake**	**Blade**	**B/let**	**PE**	**HS**	**Grind stone**		**Combi nation**		**FC**	**Total Raw Mat.**
							Upp	**Low**	**HG**	**GC**		
		%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
1	S	75	100	100	-	-	-	-	-	-	-	76.9
1	Qt	25	-	-	100	-	-	100	-	-	-	23.1
2	S	-	100	100	100	-	-	-	-	-	-	26.7
2	Qt	-	-	-	-	100	100	100	-	-	-	73.3
3	S	-	-	100	-	-	-	-	-	-	-	12.5
3	Qt	-	-	-	100	100	100	100	100	-	-	87.5
4	S	83.3	50	100	80	-	-	-	-	-	-	53.3
4	Qt	16.7	-	-	20	100	100	100	-	-	100	43.3
4	O	-	50	-	-	-	-	-	-	-	-	3.4
5	Qt	-	-	-	-	100	100	100	100	100	100	100
7\1	S	83.3	-	50	100	-	-	-	-	-	-	52.9

7\1	Qt	16.7	-	-	-	100	-	100	100	-	-	35.3
7\1	O	-	-	50	-	-	-	-	-	-	-	11.8
7\3	Qt	-	-	-	-	-	-	100	-	-	-	100
BBC L1	Qt	-	-	-	100	-	-	100	-	-	-	100
BBC L2	Qt	-	-	-	-	100	-	-	100	-	-	100
BBC L4	Qt	-	-	-	100	100	100	100	100	-	-	100
BBC L5	Qt	-	-	-	100	100	-	-	100	-	-	100
9	Qt	-	-	-	100	100	-	100	-	-	-	100

Table 8.7: Utilised/Modified lithics: Raw material by artefact categories and site/unit

(Note: B/lets = bladelets; PE = piece esquillee; HS = hammerstones; H/G = hammer/grindstone; G/C = grindstone/core; FC = flaked cobble)

Raw Materials: S = silcrete; Qt = quartzite; O = other

8.6 Retouched lithic artefacts

Retouched or formal tools show evidence of deliberate modification of a blank, for example a flake or blade, with the intention of creating a specific shape. This class of tool is unlike those in the modified/ utilised category in that the retouch is deliberate rather than the result of casual utilisation (Schweitzer & Wilson 1982:41). Some artefacts in the formal tool class show deliberate retouch but the pieces lack formal shape and fall within the category of miscellaneous retouched pieces (MRP's). Retouched tools have been divided into two distinct sub-classes, namely those that show evidence of deliberate backing and those without backing. The former sub-class includes scrapers, segments, flakes, bladelets and points; scrapers, adzes, borers and MRP's fall in the latter group.

Retouched artefacts account for 3.3 % of the total lithics at BBF, as is usual for Cape coastal sites where generally the percentage of retouched artefacts is low (Jerardino 1998, 2003; Orton 2002). A clear distinction can be made between pre- and post 2000 B.P. sites; 97% of all retouched artefacts at BBF come from the early sites, BBF 1-7, and only 3 % from BBC & BBF 9. A comparison of the relative volumes of artefacts in the other two classes shows that 44.7 % of unmodified artefacts come from the pre- 2000 B.P. sites and 55.3 % from the later sites; 68 % of utilised/ modified tools are found at BBF 1-7 and 32 % at BBC & BBF 9. Inter-class comparisons clearly demonstrate that although the frequency of lithics in all classes is higher in the post 2000 B.P. period, there is a strong trend away from the manufacture of retouched or formal tools, and of utilised/ modified artefacts during the period that BBC and BBF 9 were occupied.

Similar trends are observed at Die Kelders (Schweitzer 1979:170), Byneskranskop 1 (Schweitzer & Wilson 1982), Pearly Beach and Hawston (Avery 1976), Vaalkrans Shelter (Henshilwood & van Niekerk 2006; Nelson Bay Cave (Klein 1973; Deacon, J, 1978; Inskeep 1987), KRM 1 & 5 (Singer & Wymer 1969, Storms River Mouth middens (Deacon H.J. 1970), Hoffman's Cave (Klein unpublished) and Bonteberg Shelter (Maggs & Speed 1967) and at a number of sites in the south-western Cape (Jerardino 1998, 2003; Orton 2002; Sadr *et al* 2003; Sealy *et al* 2004). The evidence suggests that a large enough sample is now available (*cf*. Klein 1973) to demonstrate that at coastal sites retouched or formal tools are virtually absent, or present low numbers, in the post 2000 B.P. period, but also that retouched tools are substantially less frequent in the Wilton levels at coastal sites than is the case inland, for example at Melkhoutboom (Deacon, H.J. 1976) and the Wilton type site (Deacon, J. 1972).

No attempts were made in the sections dealing with unmodified or modified/ utilised artefacts to make intersite comparisons between the BBF assemblages and those from other coastal sites. Comparisons of these two classes of artefacts from Cape coastal sites may be informative in certain respects, for example whether the same types of artefacts are widely distributed or not, and which raw materials were in general use at the various sites. On the other hand the numbers of variables involved in inter-site comparisons, such as the availability of raw materials within a particular area or the kinds of activities which were site specific are often not clear from published papers or site reports, in part this is due to the limited size of most excavations and to the often large time gaps between occupation units.

As a result inter-site comparisons are broadly informative but lacking in specificity and interpretation. Any inter-site studies of Cape coastal sites which attempt to take into account a far broader range of social, economic and cultural issues would need to be more extensive and broad ranging than those currently published. Some authors have attempted to tackle some of these issues (e.g. Schweitzer & Wilson 1982; Inskeep 1987) but an expansion of their work is considered beyond the scope of this study.

In this section retouched artefacts from various Cape coastal sites and inland are compared with those from the BBF units and although the sizes of formal assemblages from the coastal sites are generally small they do offer some useful insights into the activity variations at both coastal and inland sites.

Table 8.8 provides an inventory of categories of retouched lithic artefacts and Table 8.9 lists retouched artefacts by raw material, artefact categories and site/unit.

Scrapers

Scrapers are the most common tool in the Wilton Industry and with few exceptions are generally smaller than 25 mm (Deacon H.J. 1976:58). They are usually made on flakes or flake fragments and have a flat, ventral surface that is unretouched with a working edge that may be straight, concave or convex. The working edge has been deliberately shaped by retouch and is characterised by generally small contiguous or overlapping retouch scars (Deacon, J. 1984a:384; Inskeep 1987:54).

Scrapers which are not backed account for 16.5 % of the retouched assemblage at BBF and with a few exceptions at BBF 7, are all made of silcrete. They occur at most of the pre-2000 B.P. sites but are virtually absent at BBC & BBF 9.

Scraper attributes were measured by length, width and height according to the method devised by Deacon, H.J. (1976) and Deacon, J (1984a:405) and are plotted in Figure 8.2.

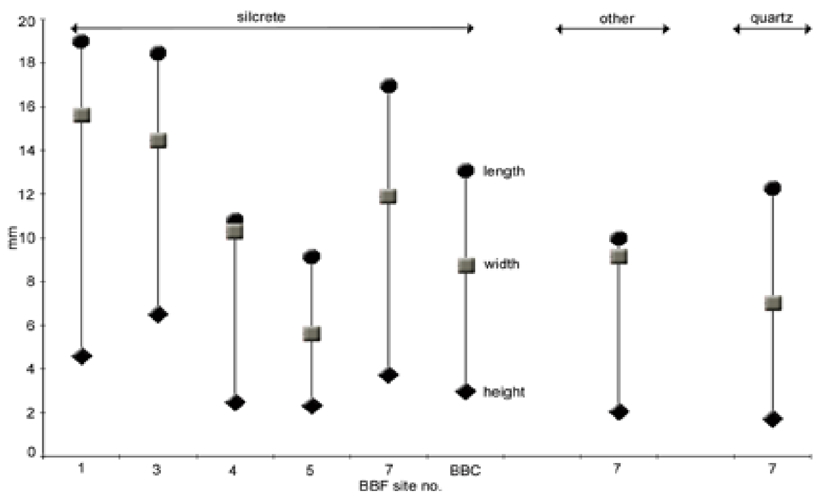


Figure 8.2: Mean scraper length, width and height by site and raw material

At BBF 1 (ca. 6960 B.P.) and BBF 3 (ca. 5960 B.P.) the mean lengths, widths and heights of silcrete scrapers are largest and are comparable in size to the silcrete scrapers from BBF 7 (ca. 3110 B.P.). Raw materials appear to have a direct influence on scraper size at BBF 7; the scrapers in CCS and quartz are considerably smaller in their overall dimensions compared to the silcrete scrapers from the same site. There is a marked decrease in the length and width of silcrete scrapers from BBF 4 (ca. 5680 B.P.) and BBF 5 (ca. 5520 B.P.).

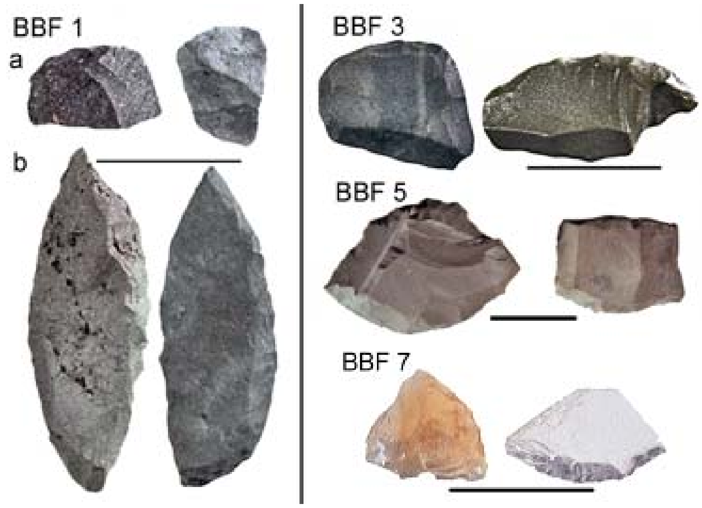


Fig. 8.3. BBF 1a) thumbnail scrapers and b) silcrete backed scrapers; BBF 3 silcrete scrapers; BBF 5 silcrete scrapers; BBF 7 quartz scrapers

Interestingly, the silcrete scrapers from BBC which post dates 2000 B.P are similar in size to those from BBF 4, but the sample size is too small to observe any trends. It is possible that the scrapers found at BBC were not manufactured at the site but collected from one of the dune sites and brought to the cave. Scrapers are also rare at Die Kelders after 2000 B.P. and less abundant at Nelson Bay Cave in the upper units. On the south-western Cape coast scrapers are rarely recorded at post 2000 B.P. sites (Jerardino 2003). For example at Dunefield Midden scrapers make up less than 0.1 % of the 'non-rounded' lithics recovered from levels that date to post c. 900 B.P. (Orton 2002). At the Kasteelberg sites on the Vredenberg Peninsula the numbers of formal tools, and scrapers, associated with hunter and/or herder occupations in the first millennium A.D. is also very low (Sadr *et al* 2003). However scrapers are relatively common in the dune deflation hollows away from the Eland's Bay coast after about 4000 B.P., as are adzes, but the numbers decrease after c. 3000 B.P., particularly in the coastal megamiddens in the region that date to c. 3000 – 2000 B.P. (Jerardino & Yates 1996, 1997)

As is the case at BBF, silcrete dominates the scraper category (83.8%) at Byneskranskop 1 (BNK); quartz scrapers are almost absent after 6000 B.P. but rapidly increase in frequency in Layers 5-3 (ca. 3900 B.P.), similar to the trend observed at BBF 7. Morphological changes in scraper size over time are also similar to those at BBF. Scrapers are longest in the lower BNK levels which pre-date 6540 B.P., those in Layers 10 - 6 (>6540 B.P.) change to being wider and shorter in size and after 3900 B.P again increase in mean size.

At the Wilton site, the climax phase of the Wilton Industry is in Layers 3F - B which coincides with the occupation of the BBF 4, 5 & 7 sites. During this period scrapers are generally short and wide and mainly in silcrete (Deacon 1972). Brooker (1989) records a reduction in scraper size at

Uniondale after ca. 5000 B.P. and similar trends are observable at Buffelskloof (Opperman 1976, 1978) and at Kangkara (Deacon 1984a). Similar trajectories in scraper size over time occur at the southern Cape sites, Oakhurst (Goodwin 1933, 1938; Fagan 1960; Schrire 1962) and Matjes River (Louw 1960) but a lack of reliable radiocarbon dates from these sites makes direct comparison difficult (also *cf.* Deacon 1984a:307).

Direct comparisons with scrapers from Nelson Bay Cave are complicated by the raw materials used at the site for scraper manufacture; differences in the raw materials used at NBC and BBF are therefore likely to affect scraper size and morphology. Only one silcrete scraper was recovered at the NBC site and the balance are in quartzite, quartz and chalcedony. The most likely explanation is a lack of availability of silcrete in the NBC region and conversely the relative abundance of silcrete in the BBF and BNK region (*cf.* Ch. 2). The mean size of the few quartz scrapers from BBF 7 are similar in size to those from NBC dating to the same time period.

In summary, the overall trend in scraper size and morphology is similar to that observed at other Wilton and Pottery Wilton sites in the southern Cape and elsewhere. At BBF the transition from longer scrapers to shorter and wider scrapers occurs at around 5700 B.P. and appears to have been a relatively rapid process after the occupation of the BBF 3 site (ca. 6000 B.P.). The mean sizes of silcrete scrapers increase again after 3110 B.P. at BBF 7, and this trend is similar to that observed at other coastal and inland sites. Scrapers made from CCS at BBF 7 are similar in size to the BBF 4 scrapers, but due to the relatively small numbers recovered (5) this observation should be treated with caution.

Generally, scrapers are the most common formal tool in the Wilton Industry (Deacon, H.J. 1976:58), for example they account for 52 % of the retouched tools at BNK 1 (Schweitzer & Wilson 1982) and 72.4 % at the Wilton site (Deacon, J. 1972). This is not the case at BBF where scrapers make up only 16.5 % of the retouched class and are overshadowed by backed scrapers which constitute 31 % of formal tools. The largest assemblage of formal tools comes from the BBF 4 site, and here scrapers account for only 7.2 % of retouched artefacts, whereas backed scrapers make up 43 % of the class total. The role of backed scrapers at BBF is discussed in greater detail below.

Adzes

Adzes show evidence of retouch or step flaking along one or both of their laterals and may be made on flakes or pebbles. They may have one or two working edges which are shaped by a set of flake scars and often display evidence of secondary step-flaking resulting from being used in a chopping motion at a steep angle (Deacon, H.J.1976:60; Deacon, J. 1984a:391; Schweitzer & Wilson

1982:49). The mean length of adzes in the southern Cape is between 25 - 40 mm making them generally larger than scrapers; over time there is less variability in the size of adzes (Deacon 1984a:391). Mastic is retained on some samples from Melkhoutboom indicating that adzes were hafted, and a few examples from this site indicate end-mounting (Deacon, H.J. 1976:60). As the opposing sides of adzes are often retouched it suggests they were sometimes reversed in their mounts (Deacon, J. 1984a:391).

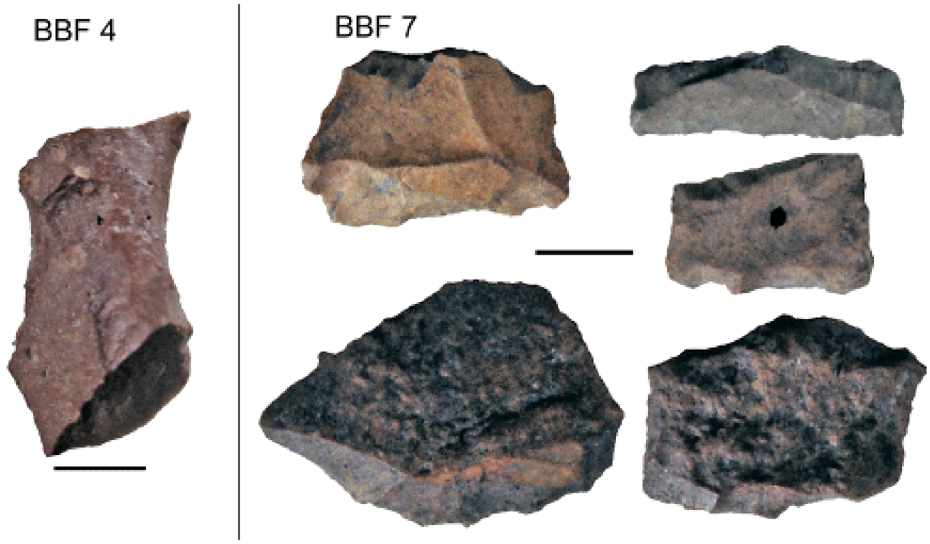


Fig. 8.4. Silcrete adzes from BBF 4 & BBF 7.

At BBF adzes account for 6 % of total retouched tools; small numbers occur at BBF 3, 4 & BBC L5. The BBF 7 site is quite exceptional as adzes constitute 38.6 % of the formal tool assemblage. If adzes were used as woodworking tools (*cf.* Mazel & Parkington 1981) then their high profile at BBF 7 may relate to the ecology of the region at the time. A series of dark, humic paleosols form the matrix for the BBF 7 layers suggesting a heavily wooded environment at the time of occupation (*cf.* Ch. 5) and lends support to the view that forest conditions in the southern Cape may have been optimal at this time (ca. 3000 B.P.) (*cf.* Ch. 2). On the south-western Cape coast adzes are relatively important at Steenbokfontein Cave and at Pancho's Kitchen Midden between c. 2700 – 2200 B.P. (Jerardino & Yates 1996, 1997). To the east of this region and towards the Cape Fold Belt mountains the frequency of adzes increases after 3500 B.P. (Manhire 1993). This apparent pattern in the increase of adze use on the south-western and southern Cape coasts (Schweitzer & Wilson 1982) at about the same time perhaps suggests an increasing emphasis on woodworking, at least in some regions, and an ameliorable climate with conditions conducive to forest growth.

A relative paucity of adzes during the early period of occupations at BBF (e.g. BBF 3 & 4) and in the later period (BBC layer L5) may relate to the relatively drier conditions predicted for these periods, but this theory must remain highly speculative until we are better able to decipher the function of adzes and of the ecology of the Holocene.

All the adzes from BBF were made in silcrete and in this respect BBF is similar to BNK 1 where 98.5 % of adzes were also in silcrete. At the NBC site adzes were probably not in use as only two doubtful examples were recovered from the whole excavated sequence (Inskeep 1987:140); they are also not present at Die Kelders (Schweitzer 1979), although H.J. Deacon (1976:60) reports that adzes are found in many eastern Cape site, for example at Wilton, Uniondale and Highlands.

Adzes from BBF 4 are only marginally smaller than those from BBF 7\1, with the largest adzes occurring in the lower layers at BBF 7. The size differences may not be temporally related but rather to the specific application of the tool, particularly as all the adzes in 7\4 are substantially larger than those from 7/ & 7\3 although the time differences between the layers is minimal. The mean sizes of the adzes from BBF fall within the size ranges reported from BNK 1 (Schweitzer & Wilson 1982:49) and for the southern Cape in general (*cf.* Deacon, J. 1984:391).

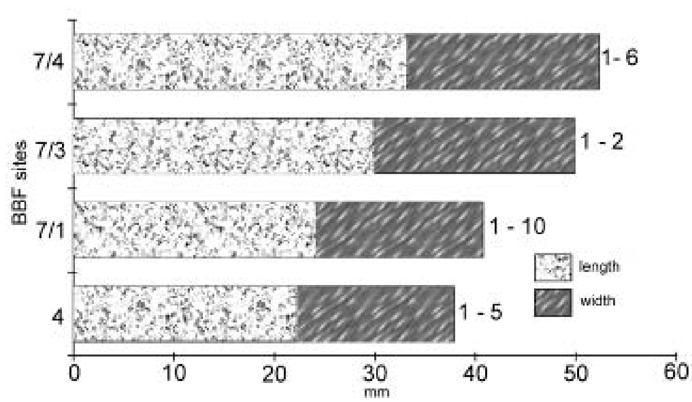


Figure 8.5: Mean sizes of adzes from BBF sites

Backed Pieces

Backed microliths are usually made on flakes or blades and are characterised by the presence of backing, with abrupt retouch along one lateral margin and a sharp edge along the other margin (Akazawa *et al* 1980:88). The classification of sub-classes of backed pieces are based on the shape of the backed margin, for example segments are curved and backed bladelets are straight. Backed microliths are less than 25 mm in length, are characteristic of LSA assemblages and are usually made on fine grained materials such as silcrete, CCS, quartz and hornfels (Deacon, J. 1984a:390). Backing or abrupt retouch on a tool may increase its purchase when inserted in mastic prior to, or during, hafting (Inskeep 1987:54). Sub-classes of backed pieces include scrapers, segments, flakes, bladelets and backed points (Table 8.8).

Backed pieces account for 60 % of the retouched tools from BBF sites and are only found in the sites/units which pre-date 3110 B.P. The two backed flakes from BBC are doubtful. Silcrete is predominantly used at BBF in the production of backed pieces although there are a few examples in quartz and CCS (Table 8.9).

Backed scrapers

Backed scrapers or 'double scrapers' have scraper retouch on one of the arcs with backing on the other arc and are ellipsoidal in shape. The angle of backing varies between 60 - 90 degrees but most examples from BBF are closer to 90 degrees. Typologically, backed scrapers are intermediate between segments and scrapers in that they have the backed arc of segments, but the opposite chord has retouch typical of scrapers (Schweitzer & Wilson 1982:51-52). At BBF 4 backed scrapers, segments and convex scrapers are found within the same assemblage. Backed scrapers and convex scrapers are morphologically different but may have been used to perform similar functions (*cf*. Wendt 1972:31); Schweitzer & Wilson (1982: 51-52) take the view that because scrapers, backed scrapers and segments occur in the same assemblages there are likely to have been functional differences in their application. As Inskeep (1987:54) has pointed out use-wear analysis may help to resolve this functional issue.

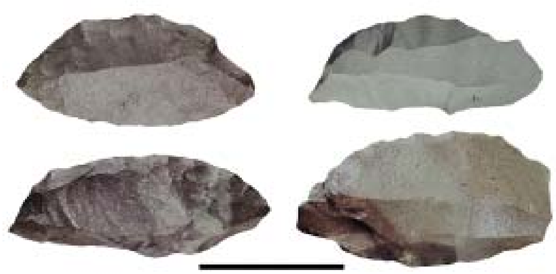


Fig. 8.6. BBF 4: silcrete backed scrapers

A further contentious issue regards the spatial distribution of backed scrapers, and whether some of the southern and south-western Cape lithic assemblages fall within the 'typical' Wilton type Industry described from the Wilton type-site (Deacon, J. 1972), Melkhoutboom, Highlands Rock Shelter (Deacon, H.J. 1976) and Boomplaas (Deacon, J. 1984a). The boundaries of the 'typical' Wilton Industry are given by H.J. Deacon (1976:171) as being the Gouritz River Mouth in the west and the Great Fish River to the east. Within this region, which incorporates the Cape Folded Mountains in the eastern Cape, the Wilton name has validity but the problem has been to define the temporal and geographical limits of this Industry. The occurence of certain backed elements in assemblages to the west of the Gouritz River led Deacon (1976:171) to conclude

West of these limits there would seem to be artefact occurrences, known from the pioneer researches of Heese, which do not share the same hafted tool, designs and would fall outside any concept of a specific Wilton content unit.

East of the Gouritz River, backed scrapers are generally rare; only 8 specimens were recovered at NBC (Inskeep 1987) and a few at Oakhurst (Schrire 1962), but the dating and curation of this latter assemblage is problematic; in Layer C at Matjes River, 74 backed scrapers are reported but undated (Louw 1960).

As H.J. Deacon (1976) correctly predicted, hafted tools from assemblages to the west of the Gouritz River increase rapidly in frequency relative to scrapers. An example of this is at BNK 1 where backed scrapers account for 7.4 % of retouched tools at the site and 33 % of backed pieces. Small numbers of backed scrapers come from BBF 1, 5 & 7\1, but the largest assemblage of retouched artefacts is from BBF 4 (5680 ± 70 B.P.). Of the 325 retouched tools recovered from this site, 139 (42,7 %) are backed scrapers and a further 33.5 % are backed pieces; scrapers from BBF 4 make up only 7,7 % of the formal tools. All the backed scrapers are made in silcrete. The remarkable similarity in the mean lengths, widths and heights of backed scrapers, segments, flakes and blades suggest that these tools were being made to a specific size pattern, perhaps because they were hafted in a similar way; backed bladelets and points are noticeably smaller which may be a function of use or hafting technique (Fig. 8.3).

In the 1930s Heese (n.d.) made a surface collection of artefacts at Brakfontein, situated 25 km to the north-west of BBF. More than 30,000 scrapers, backed pieces, adzes and segments were collected; it is thought that at least 10,000 of these artefacts, now housed at the University of Stellenbosch and inspected by the author, may be backed scrapers (Deacon, H.J. pers. comm.). Excavations at the Castle in Cape Town have also revealed the presence of backed scrapers in the south-western Cape (Yates pers. comm.) and a few backed scrapers come from the c. 2300 B.P. levels at Steenbokfontein. Clearly, the hafted tool components at BBF 4 and BNK 1, and possibly Brakfontein, set these sites apart from 'typical' Wilton assemblages described by J. Deacon (1972) and H.J. Deacon (1976). The reasons for the high numbers of backed artefacts are not clear and may indicate different cultural affinities between people in the eastern and western regions and/or may be activity related.

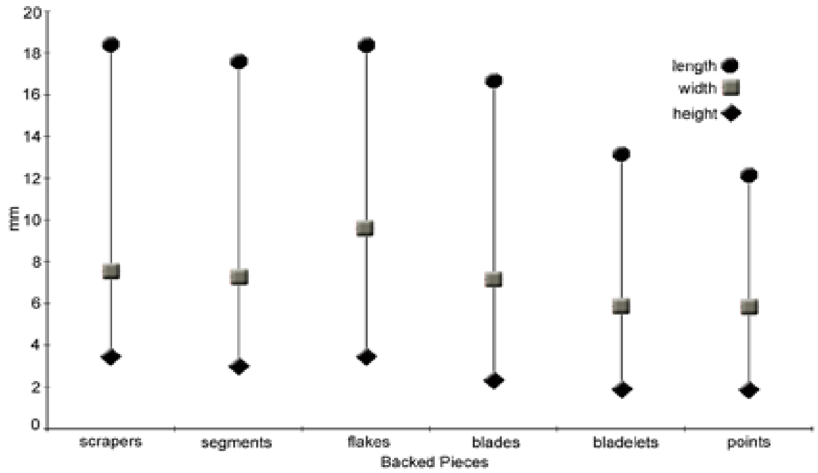


Figure 8.7: Mean lengths, widths and heights of backed pieces from BBF 4

Segments, Flakes, Bladelets, Points and Borers

Segments are made on flakes or blades to form a curved arc backed with abrupt retouch and an opposite sharp-edged unretouched chord. It may have been used as a cutting tool, as is suggested by an artefact from De Hangen in which a segment is mounted in a lump of mastic so that it projects at an oblique angle (Parkington pers. comm.); a quartz segment mounted in mastic is reported from BNK 1 (Schweitzer 1982:61); evidence of segments being mounted was also found at Melkhoutboom (Deacon. H.J. 1976:58) and at NBC (Inskeep 1987:120). Middle Stone Age Howiesons Poort segments were also mounted on armatures for use as weapons more than 55 000 years ago in Kwazulu Natal and in the Western Cape (Lombard 2007b, 2008).

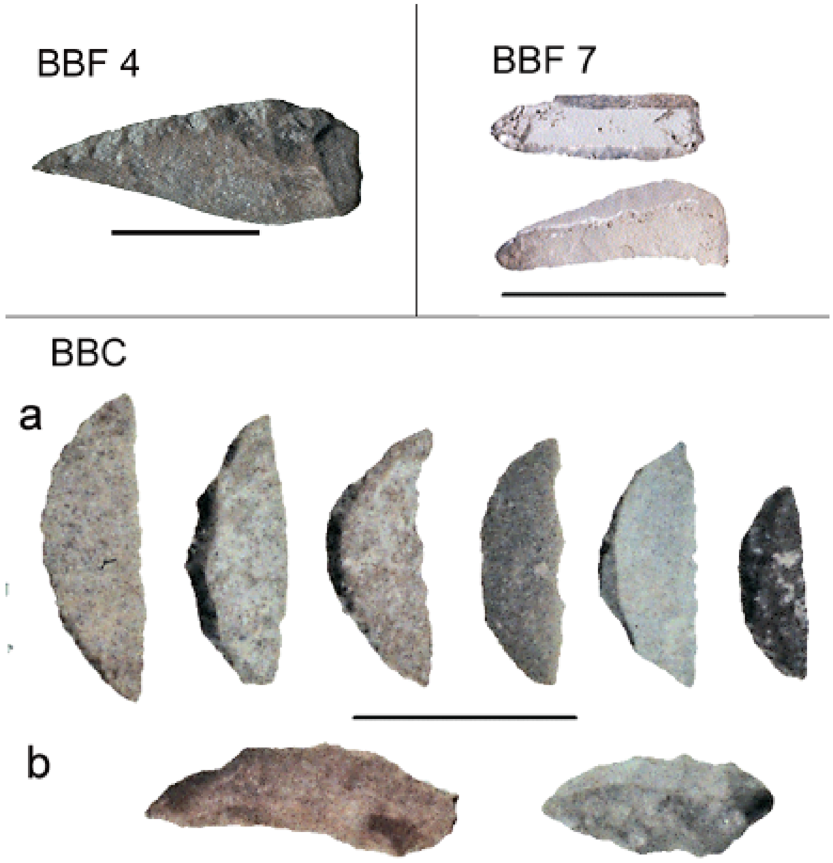


Fig. 8.8. BBF 4 silcrete scraper/borer; BBF 7 quartz borers; BBC (a) silcrete & quartzite segments; BBC (b) Quartzite borers

Segments were recovered from BBF 1, 3 & 5 and account for 23 % of all backed pieces; 96 % of the segments are made of silcrete and the balance are in quartz and CCS. At BBF 4 segments make up 15 % of the total assemblage and 20 % of backed pieces. The disproportionately high numbers of backed scrapers found at BBF 4 decreases the relative percentage of segments and other backed pieces at the site. At BNK 1 segments are the most common backed artefact accounting for 42 % of the class total; at Wilton segments make up 32 % of backed pieces and 71 % of segments are in silcrete. Only 40 segments were found in all the NBC units, the majority are in chalcedony (72.5 %), and the rest in quartz and quartzite which reinforces the evidence that silcrete was rarely used at the site (*cf*. Inskeep 1987).

Backed flakes are morphologically diverse but are characterised by being backed wholly, or partially, along one edge. Sampson (1974) suggests that backed flakes may, after constant use, take the form of backed scrapers but Schweitzer & Wilson (1982:62) point to a lack of intermediate forms at BNK 1 which does not support Sampson's hypothesis; additionally few of the backed flakes from BNK 1 have a convex backed lateral, a prerequisite for backed scrapers. Backed flakes could be classed as intermediate tools as some examples are very similar to borers and others to scrapers. At BBF 4, backed flakes make up 14 % of the retouched class and 16.5 % of backed pieces; 91 % are in silcrete and the rest in quartz and CCS. Most backed flakes from BNK 1 are in silcrete (88.5 %) but are less frequent in the retouched class (4.2 %) than is the case at BBF.

Backed blades and bladelets form only a small percentage of the BBF 4 backed class (2.8 %) and all are in silcrete; only one other example was found at BBF 2. In plan form backed bladelets have two or more straight margins and show backing along one margin and a straight cutting edge opposite. Small frequencies of this tool type are reported from BNK 1 (Schweitzer & Wilson 1982) and NBC (Inskeep 1987). At Wilton they are more common (22.6 % of backed tools), as well as at other eastern Cape sites (Deacon, H.J. 1976), again highlighting differences in the relative importance of certain tool types in the two regions.

Backed points are similar to borers (drills) but display evidence of backing along one or both the laterals to form a tapered point . Borers tend to be cylindrical in shape but the retouch on these artefacts does not conform to the 'backing' observable on backed points (Schweitzer & Wilson 1982); both forms were probably hafted and used as drill-bits (Inskeep 1987:54). At Melkhoutboom traces of mastic are evident on some borers, suggesting that only the sharp tip of the tool was exposed for use (Deacon, H.J. 1976:59). Backed points and borers occur in small numbers at BBF 1, 2, 4 and 7\1 suggesting they were in use from the earliest occupation up until around 3000 B.P. Raw materials used include quartz and silcrete. Borers are in use at BNK 1, NBC and Melkhoutboom during the same period as at BBF

Miscellaneous Retouched Pieces (MRP's)

These artefacts cannot be typologically assigned to any of the more cohesive classes of retouched artefacts except that all show sustained formal retouch either on the dorsal or ventral surface of the tool, or on both. Many of these tools could be included in the utilised/modified class (cf. Inskeep 1987:55) but they are separated on the basis that the retouch is more deliberate and extends over a larger portion of the tool (Deacon, J, 1984a); in practice, the differences between utilised flakes, blades etc. and MRP's are marginal. MRP's are found in most assemblages of Holocene age throughout the Cape region (Deacon 1984a). Most MRP's in the pre 2000 B.P. sites at BBF are made on silcrete, those at BBC & BBF 9 have a wider range of raw materials including quartz and quartzite. In total, MRP's account for 16 % of retouched artefacts from BBF sites and are the most common retouched artefact found in the later sites, although only in very small quantities in the BBC units.

Site/ unit	Scrapers	Adzes	Backed Pieces					Borers	MRP	Site total
			Scraper	Segment	Flake	Bladelet	Point	(drills)		
	n	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**
1	16	0	2	15	0	0	5	2	10	50
2	3	0	0	0	0	1	1	0	3	8
3	4	1	0	0	1	0	0	0	3	9
4	25	5	139	50	47	8	4	0	47	325
5	2	0	4	1	0	0	0	0	1	8
6	1	0	0	0	0	0	0	0	1	2
7\1	16	12	2	0	0	0	2	2	5	39
7\2	4	0	0	0	0	0	0	0	0	4
7\3	0	2	0	0	0	0	0	0	0	2
7\4	4	8	0	0	0	0	0	0	0	12
BBC L1	0	0	0	0	1	0	0	0	1	2
BBC L2	1	0	0	0	0	0	0	0	1	2
BBC L4	2	0	0	0	1	0	0	0	1	4
BBC L5	0	1	0	0	0	0	0	0	1	2
9	0	0	0	0	0	0	0	0	3	3
Total	78	29	147	66	50	9	12	4	77	472

Table 8.8: Inventory of categories of retouched lithic artefacts

Site/ unit	Raw Material	Scrapers	Adzes	Backed Pcs.					Borer	MRP	Total
				Scrapers	**Segments**	**Flakes**	**B/lets**	**Points**	**(drills)**		**RM**
			%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
1	S	100	0	100	100	0	0	100	100	100	
2	Q	0	0	0	0	0	0	100	0	0	
2	S	100	0	0	0	0	100	0	0	100	

3	Q	0	0	0	0	100	0	0	0	0
3	S	100	100	0	0	0	0	0	0	100
4	Q	0	0	0	2.1	0	0	0	0	2.1
4	S	100	100	100	94.6	90.7	100	100	0	97.9
4	O	0	0	0	4.3	9.3	0	0	0	0
5	S	100	0	100	100	0	0	0	0	100
6\12	Q	100	0	0	0	0	0	0	0	0
6\12	S	0	0	0	0	0	0	0	0	100
7\1	Q	6.7	0	0	0	0	0	100	100	0
7\1	S	93.3	100	100	0	0	0	0	0	100
7\2	O	100	0	0	0	0	0	0	0	0
7\3	S	0	100	0	0	0	0	0	0	0
7\4	S	50	100	0	0	0	0	0	0	0
7\4	O	50	0	0	0	0	0	0	0	0
BBC L1	Qt	0	0	0	0	100	0	0	0	100
BBC L2	S	100	0	0	0	0	0	0	0	100
BBC L4	Q	0	0	0	0	100	0	0	0	0
BBC L4	S	50	0	0	0	0	0	0	0	100
BBC L4	Qt	50	0	0	0	0	0	0	0	0
BBC L5	Q	0	0	0	0	0	0	0	0	100

BBC L5	S	0	100	0	0	0	0	0	0	0
9	Q	0	0	0	0	0	0	0	0	100

Table 8.9: Retouched lithics: Raw material by artefact categories and site/unit

(Note: MRP = miscellaneous retouched pieces; RM = raw material)

8.7: Bone Artefacts

Very few bone artefacts were recovered at BBF and all came from the later sites, BBC & BBF 9. One bone spatula, possibly made on a limb bone, was found at BBF 7, measuring 40.5 mm in length and 5.3 mm in width. Some wear is evident along half the length of the tool. A similar bone spatula was recovered from the Vaalkrans Shelter site in De Hoop Nature reserve and is dated at about 1660 – 1680 AD (Henshilwood & van Niekerk 2006). Schweitzer & Wilson (1982:77) suggest that bone spatulas may have been used to pry shellfish from the rocks; however, it is not clear from the wear patterns on the BBF 7 spatula, nor that from Vaalkrans, whether it was used for this purpose. Based on the wear patterns and shape of some bone spatulas from NBC Inskeep (1987:164) has speculated they may have been used for working skins.

Fig. 8.9. a) Bone artefacts from BBC (various layers), b) BBC bone beads (Image courtesy of Francesco d'Errico)

Two bone tubes, possibly used as beads, with an interior diameter of 5.7 mm and exterior diameter of 9.4 mm, were recovered from BBC layer L5 dated at 1840 B.P. Similar bone tubes are reported from a number of southern and south-western Cape sites including Oakhurst (Goodwin 1933, 1938), Gordon's Bay Midden (van Noten 1974), Die Kelders (Schweitzer 1979) and Byneskranskop

1 (Schweitzer & Wilson 1982). At all these sites bone tubes are only found in units which post-date 3900 B.P.

A single turtle carapace, identified as *Pelomedusa subrufa*, was found intact in BBC layer L4. Numerous scrape marks on the interior and grinding on the edges suggests it was used as a bowl, possibly to store or mix ochre, as both the edges and inner surface were ochre stained. As this species of turtle is not currently found in the immediate vicinity of BBF, it may have been captured in the Duivenhoks or Goukou Rivers and brought to the site. Worked tortoise carapaces are reported from Uniondale (Brooker 1989) and NBC (Inskeep 1987). A watercolour painted by F. Steeb in 1812 depicts a 'Bushman' with a tortoise shell container and a bone suspended from his neck (Sketch no. 96: Cape Archives A1415(73))..

8.8: Marine Shell Artefacts

Marine shell pendants and beads were found at BBF 7 and BBC only. Two perforated and ground *Conus* shells from BBC L2 and one from BBC L3 were probably threaded and used as ornaments. All three shells have v-shaped grooved perforations on the anterior end consistent with deliberate filing (Vibe 2007:63). Two of them have worn perforations, suggesting they were strung. The pendants measure between 21 and 29 mm in length, and all show traces of ochre (Vibe 2007:63). Almost identical artefacts come from Layer 1 and 12 at BNK 1, and from Units 18 and 36 at NBC, suggesting that *Conus* shells were used as decorative items from the Mid-Holocene. A single ground *Turbo* pendant measuring 36 mm x 14.5 mm was found in BBC L5. Similar items are common at BNK 1 and NBC and are also found at inland sites, for example Uniondale (Brooker 1989), suggesting they were in widespread use during the Mid- and Late Holocene.

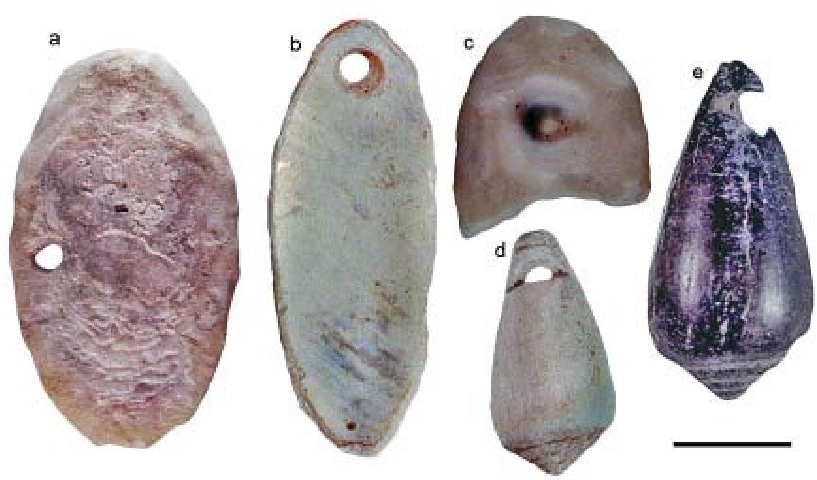


Fig. 8.10. BBC: marine shell personal ornaments a) bored Patella, b) bored Turbo sarmaticus, c) partially bored Turbo sarmaticus, d) bored Conus, e) bored Conus (burnt).

Four *Glycimeris connollyi* pendants were recovered from the BBC LSA layers (Vibe 2007). They measure between 9 x 9 mm and 14 x 15 mm. Two of them were found in the same square and level in L2, and are probably from the same beadwork item. They are both perforated (probably by punching) on the apex, and wear traces are visible on the perforation edges (Vibe 2007:62). The other two *G. connollyi* pendants were found in L4. These pendants have perforations on the apices consistent with drilling through the shell by *Natica tecta* or another similar predator. However, they both show traces of wear on the perforation edges, probably from being strung (Vibe 2007:62). All four pendants are stained with ochre. Similar items are found at BNK 1, NBC and Die Kelders. One perforated shell pendant from a mother-of-pearl colored shell, possibly *Haliotis sp.* or *Turbo sp.*, was recovered from BBC L1 (Vibe 2007). One *Bullia digitalis* pendant measuring 25 mm was recovered from BBC L4. It was perforated by punching and show wear all along the perforation ridge. It also shows traces of ochre (Vibe 2007).

Nassarius kraussianus shells were found only at BBC, and a total number of 1886 shells were recovered. Of these are 367 shells not perforated, but are counted into the total number as it is highly likely they were intended for bead manufacture (Vibe 2007:58). Particularly high concentrations (55% of the total number) of the shells were recovered from L4 (Vibe 2007:57). Taphonomic, morphological and microscopic analyses prove the authenticity of the perforated LSA *N. kraussianus* shells as human made beads (Vibe 2007).

A large proportion of the *N. kraussianus* shells have perforations and show use-wear traces consistent with bead manufacture and use (Vibe 2007:59-61). The perforation type on all shells with perforations and intact lip and columella (category 2 shells) was recorded with a system based on the method established by d'Errico *et al.* (2005) for the BBC MSA shells. Perforation types 3, 5, 6, 8, and 9 are present on the LSA shells. Perforation type 8 is by far the most common (88 % of the total number of 501 category 2 shells), and these large perforations are probably due to the prolonged use of the shells as threaded beads (Vibe 2007:59, d'Errico *et al*. 2005:15). Wear-traces are visible on 78.6 % of the category 2 shells (Vibe 2007:60). An examination of a random sample of category 2 shells from all LSA levels in BBC showed that 46% of the beads had traces of ochre (Vibe 2007:61).

A single *Turbo sarmaticus* pendant came from the HL3 level in BBF 7. It is oblong in shape and measures 2.1 x 4.2 cm (Vibe 2007:62). The edges are perfectly ground and rounded, otherwise it is not worked. It is not perforated, but it is highly likely it was intended for ornamentation as other similar non-complete "pendants" have been found at other sites along with finished ones (Schweitzer 1979, Schweitzer & Wilson 1982, Inskeep 1987). A *conus sp.* pendant, 3.1 cm long, was recovered from the YSL level. This shell is perforated, probably by punching, and very worn (Vibe 2007:62). All the marine shell species used to occur in the vicinity of the sites and were possibly collected there.

8.9: Ostrich Egg-Shell Artefacts

Ostrich egg-shell fragments were found in varying quantities at all sites, but are particularly common at BBF 2, 4 & 7 (Vibe 2007:16). Fragments with ground edges came only from BBF 7, but the purpose of this grinding is unknown; Schweitzer & Wilson (1982:91) suggest they may be parts of pendants or discs. One flask opening, presumably from a water bottle *(cf.* Inskeep 1987:173), was recovered from BBF 3; decorated fragments occur only at BBF 3 and BBF 4 (Table 8.10). Two types of decoration were recorded, namely parallel incised lines and looped circles. The former design is similar to that from Layer 6 at BNK1 (precise date not given) and unit 78 at NBC (4520 B.P.). The looped circle design from BBF 4 is identical to that found on OES fragments found in Layer 9 at BNK1 dated at ca. 6000 B.P.(Schweitzer & Wilson 1982). BBF 4 is dated at 5680 B.P. suggesting that this looped circle design may have been a cultural marker in the area to the west of the Gouritz River, although more samples would be needed to confirm this hypothesis.

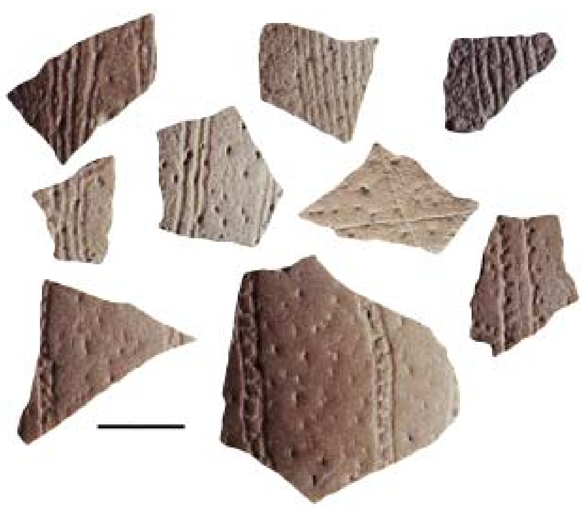


Fig. 8.11. Decorated ostrich egg shell from BBF 4.

Site	Plain Frags.	Ground Frags.	Total Plain + Ground	Flask openings	Decorated frags.	AD/kg
	g	g	g	n	n	
1	251	-	251	-		7.1

2	1435	-	1435	-	-	7.7
3	334	-	334	1	1	2.0
4	1149	-	1149	-	19	5.7
5	47	-	47	-	-	0.5
6	7	-	7	-	-	0
7	1020	79	1099	-	-	7.4
8	79	-	79	-	-	0.1
9	1	-	1	-	-	0

Table 8.10: Ostrich egg-shell data from BBF sites

(AD/Kg = average density of ostrich shell per kg of deposit recovered, excluding stone)

Beads

Beads were found at all the BBF sites apart from BBF 6 (Vibe 2007). Whole or partially finished beads are the most common artefacts made in ostrich egg-shell. They are particularly common at BBF 4, BBF 7 and BBC. Table 8.11 reflects the numbers of finished and unfinished beads recovered from each site.

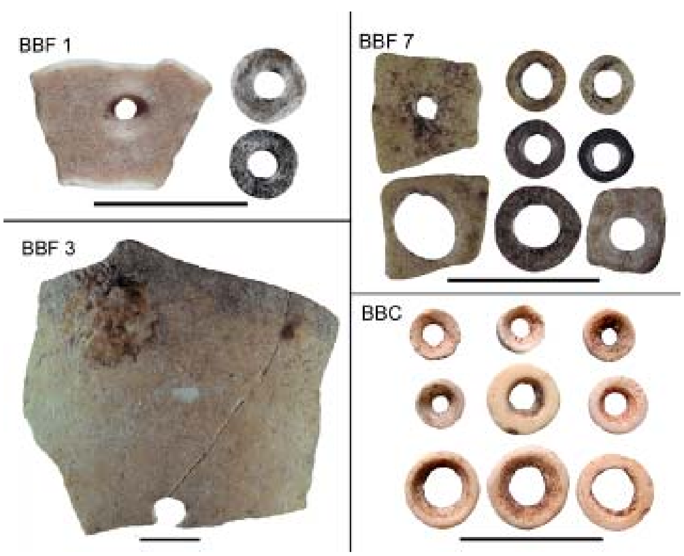


Fig. 8.12. Completed and part completed ostrich egg shell beads from BBF 1, 3, 7 & BBC

Site	Finished Beads	Unfinished Beads	Indeterminable*	Total Beads
1	10	3	-	13

2	5	-	-	5
3	6	4	-	10
4	25	65	2	92
5	1	4	-	5
7	53	31	26	110
8	260	30	-	290
9	1	1	-	2
Total	361	138	28	527

Table 8.11: Frequency of finished and unfinished beads at BBF sites. (*The production stage of some of the beads from BBF 4 and 7 was not determinable due to wind and weather exposure of the deposit in the sites)

Analyses of the ostrich eggshell beads from BBF 4, BBF 7 and BBC show that it is likely that production of beads took place on site (in BBC in L1 and L2 only) (Vibe 2007:48). They were made by first; perforating a shell fragment from the internal side and next; preparing the fragments by trimming and grinding (Vibe 2007:66). Colour differentiation was achieved by burning some of the beads and adding different organic materials during burning (Conard & Kandel 2005). However, a large amount of the beads in BBF 4, BBF 7 and BBC were not coloured (74% in Blombos Cave, 59% in the three sites together) (Vibe 2007:56).

Colour	**BBF 4**	**BBF 7**	**BBC**	**Total**
Beige	38 %	15 %	3 %	12 %
Black	1 %	2 %	1 %	1 %
Brown	7 %	11 %	6 %	7 %
Grey	15 %	21 %	12 %	15 %
Light brown	-	10 %	4 %	4 %
Light grey	7 %	1 %	-	1 %
White	33 %	40 %	74 %	59 %

Table 8.12 Colour of ostrich eggshell beads at BBF 4, BBF 7 and BBC. (From Vibe 2007).

All ostrich eggshell beads from BBF 4, BBF 7 and BBC were inspected for traces of ochre. Of the ostrich eggshell beads from BBC 74% show traces of ochre. In contrast to this, ochre is visible on only 2% of the BBF 4 beads and 12% of the beads from BBC 7 (Vibe 2007:56). This is probably due to wind and weather exposure of the site deposit. The internal diameter of each bead was measured and the mean diameters for each site are given in Figure 8.13.

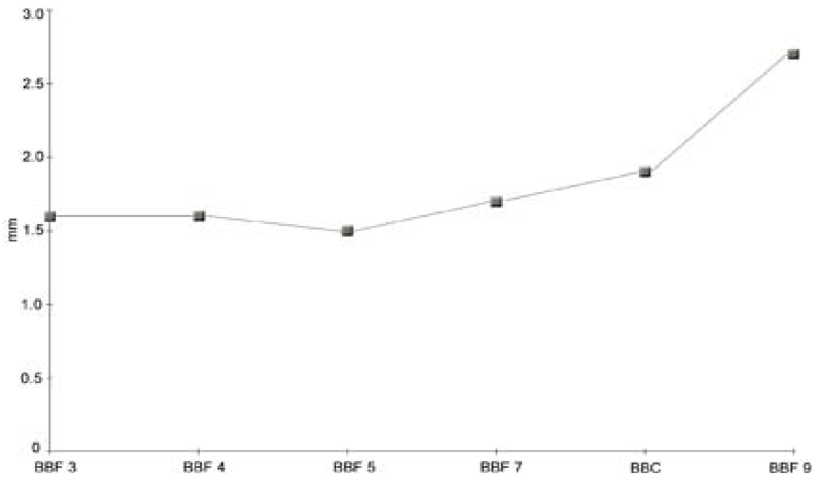


Fig. 8.13: Mean aperture diameters of ostrich egg-shell beads from BBF sites

Bead apertures are similar at BBF 3, 4 & 5 dating to between ca. 6000 - 5000 B.P. and then increase in size after ca. 3000 B.P. Unfortunately the BBF sample is too small to make a definitive statement relating size to age. In a study by Vibe (2007) the size of BBF 4, BBF 7 and BBC finished intact beads and finished, broken beads where more than half of the bead was intact was recorded. The mean diameters for each site are given in Table 8.13.

Site	**Layer**	**LSA time period**	**Mean diameter of beads**
BBF 4	-	Classic Wilton	4.05 mm
BBF 7	-	Late Wilton	4.61 mm
BBC	6	Herder/Pottery Wilton	4.12 mm
BBC	1	Herder/Pottery Wilton	5.34 mm
BBC	All	Herder/Pottery Wilton	4.67 mm

Table 8.13 Mean diameter (mm) of ostrich eggshell beads in different LSA time periods in the Garcia State Forest and Blombos Nature Reserve. (From Vibe 2007).

Measurements of aperture were also made on BBF 4, BBF 7 and BBC measurable beads of the same category as above. The mean aperture diameters for each site are given in Table 8.14.

Site	**Layer**	**LSA time period**	**Mean aperture size of beads**
BBF 4	-	Classic Wilton	1.73 mm
BBF 7	-	Late Wilton	1.77 mm
BBC	6	Herder/Pottery Wilton	Not available*
BBC	1	Herder/Pottery Wilton	2.22 mm

BBC	All	Herder/Pottery Wilton	1.90 mm

Table 8.14 Mean internal diameter (aperture size) of ostrich eggshell beads in different LSA time periods in the Garcia State Forest and Blombos Nature Reserve. (From Vibe 2007). (*The apertures of the beads in Layer 6 in Blombos Cave were not measurable.)

Analyses of the ostrich eggshell beads from BBF 4, BBF 7 and BBC show that there is a small increase in bead size and bead aperture within the area and within Blombos Cave over time. The beads from pre-herder sites BBF 4 and BBF 7 have a mean diameter less than 5 mm, which is the suggested division between hunter-gatherer associated and herder associated beads (Yates 1995, Conard & Kandel 2005). A total comparison of the beads from BBC also gives a mean diameter less than 5 mm, but a comparison of beads in different layers shows that the mean is increasing over time (Vibe 2007). The mean diameter of the beads in the upper layer, L1, is 5.34 mm.

Personal Ornaments: Other

One broken bone ring was recovered from L4 in BBC. Two intact ones, measuring 9.3 and 9.9 mm in diameter, were found in the same square and level in L5, suggesting they come from the same beadwork item. These two bone rings also show traces of ochre. All three are finely worked and polished (Vibe 2007:64).

One piece of string made from plant material was recovered from BBC L4 (Vibe 2007). It is not possible to determine whether its use was related to any of the ornaments, but it may have been used to string beads. The string is +/- 15 cm long, ca. 2 mm thick, and weighs about 20 grams. It is a 12/6 ply string, meaning two and two fibre lengths, or strands, are twined into 6 strings which again are twined into one string (Vibe 2007:65). It has no knots. The string is coated in deposit from the cave, including tiny pieces of silica and quartz.

8.10: Pottery

Relatively small quantities of pottery sherds came from the BBC cave site, although the frequencies increase in Layers BBC L1 and BBC L2 and ten sherds came from BBF 9. Unfortunately most of the pottery sherds were small and therefore not very informative as to the type or shape of vessels from which they originated. A few diagnostic vessel rims without decoration came from the later BBC units and BBF 9 but it was not possible to reconcile these with Rudner's (1968:523-524) descriptions of pottery types from this area. The oldest sherds were from BBC L5 dated at 1840 B.P., and were found in the same layer as the two sheep bones dated at 1880 B.P. and 1960 B.P., suggesting that sheep and pottery were contemporaneous at this time (for a full discussion *cf*. Ch. 7). Table 8.15 lists the characteristics of the BBC & BBF 9 pottery.

Site/unit	Sherds		Finish			Temper	Vessel rims	Thickness
			Burnished	Burnished /Ochre	Unburnished /Ochre	Quartz		(mean)
	n	g	n	n	n	n	n	mm
BBC L1	69	74	68	1	-	61	7	5.0
BBC L2	10	38	3	6	2	2	3	6.4
BBC L3	1	9	-	-	-	-	-	4.5
BBC L4	2	14.5	1	-	-	-	-	5.3
BBC L5	2	10	2	-	-	-	-	6
9	10	49	5	3	2	-	1	5.4

Table 8.15: Inventory of pottery sherds from BBC & BBF 9

Black burnishing, possibly with soot, is fairly common and only a few sherds have a reddish tinge indicative of ochre burnishing. In the upper units there are crushed quartz chip inclusions in the sherds, probably to temper the pottery but this method of tempering is not evident in the lower levels of BBC, nor at BBF 9, although rounded quartz grains are evident in the pottery. In the upper units at Boomplaas, Deacon *et al* (1978) record that crushed quartz chip inclusions are more common, possibly to add greater strength to the pottery; irregular grains provide greater strength to the clay body than rounded quartz grains (Schweitzer & Wilson 1982:95). None of the vessel rims show indications of lug attachments which may be suggestive of Khoekhoe pottery (Rudner 1968). Mean thicknesses of the sherds vary minimally and are similar to the thickness of five pots, one almost complete, collected by Rudner (1968:523) at Blombos. The almost complete pot has a 'straight, contracted neck with an overturned, rounded and incorporated rim with a trimming groove and there are two horizontally pierced, internally reinforced lugs with rounded bridges'.

Fig. 8.14. Pottery sherds from the OHA and KHA units at BBF 9.

Fig. 8.15. In situ pottery sherds and reconstructed pot (inset) recovered c. 100 m south of the BBF 9 site. The pot is not dated.

8.11: Summary

Lithic artefacts are the most numerous of the cultural artefacts recovered from the BBF sites. Raw materials include silcrete, quartz, quartzite and small quantities of 'other' materials which include CCS, shale, manganese oxide and shale. Distinct patterns can be observed in the use of raw materials over time. Silcrete predominates at sites which predate 2000 B.P., although one exception is at BBF 2 where quartz is in common use in the unmodified category. Quartzite occurs throughout the whole BBF sequence, possibly due to its ready availability in the immediate area. Because of the relatively large size range, and weight, of quartzite cobbles and pebbles they are suitable for opportunistic use as hammers, anvils, upper and lower grinders; occasionally quartzite flakes are utilised. Quartzite is unknown in the retouched category prior to 2000 B.P. at BBF when almost all retouched or formal tools are manufactured in silcrete, and occasionally in quartz. There appears to be no strong relationship between the frequency of quartz in the unmodified category at a site and the number of retouched artefacts in quartz from that site. An example is the BBF 2 site where 46.7 % of the unmodified stone is quartz yet 87. 5 % of the retouched artefacts are in silcrete. We can confidently say that at all the pre-2000 B.P. BBF sites silcrete is overwhelmingly the preferred material for the manufacture of retouched artefacts and that a clear distinction can be drawn between the pre- and post- 2000 B.P. sites in the choice of raw materials used. Quartz and quartzite, which are both available in the immediate vicinity of BBF predominate after 2000 B.P.

Silcrete is not available in the immediate BBF vicinity and would have been brought to the sites from further afield, possibly from Riversdale or Albertinia (Henshilwood *et al* 2001a). A reduction in the quantity of silcrete at later sites suggests it may not have been a desirable material for the types of tools manufactured, or that it was not easily obtainable. If the seasonal range of hunter gatherer groups was reduced after the arrival of herders (*cf.* Ch 4 & 7), then silcrete sources, situated inland, may not have been easily accessible.

Utilised/modified artefacts make up the smallest class of lithic artefacts. Silcrete flakes and bladelets showing utilisation damage occur in limited quantities in sites pre-dating 2000 B.P. Scaled pieces are more common throughout the BBF sequence and are made on a wider variety of raw materials including quartz, quartzite and silcrete. Hammerstones, anvils and grindstones are a regular feature at most sites and were probably used for a range of functions including the production of lithic artefacts, grinding of ochre and processing plant materials and shellfish. BBF 5 has the highest incidence of hammerstones and anvils and may have been a shellfish processing location *(cf.* Ch. 6).

Retouched or formal tools account for 3.3 % of the total lithics at BBF as is usual for Cape coastal sites where the incidence of this class is generally low. Retouched artefacts predominate in the pre-2000 B.P. sites and are still common ca. 3000 B.P. at the BBF 7 site. Scrapers, normally the most common retouched artefact in Wilton assemblages only make up 16.5 % of the formal tool class at BBF. Changes in the mean sizes of scrapers are temporally related and these grade from longer and broader scrapers in the early sites BBF 1 & 3 to smaller broad scrapers by the Mid-Holocene, and again back to longer scrapers by 3000 B.P. A similar trend in scraper morphology is reported from a number of other Cape sites including BNK 1 and NBC. Adzes may have been woodworking tools and are most common at the BBF 7 site. Dark, humic paleosols at the site point to the BBF area being wooded at the time of the BBF 7 occupation and palaeoenvironmental conditions may explain the high frequency of adzes found here.

Backed lithic elements make up a major proportion of the retouched class at BBF sites predating 2000 B.P. Tools with backing include segments, flakes, bladelets, points and scrapers. The lithic assemblage from BBF 4 is the most informative of the pre-2000 B.P. sites, partially because of is size, but also due to the unusually high ratio of backed tools within the retouched class. Deacon (1976) suggested that lithic assemblages to the west of the Gouritz River did not share the same hafted tool components as those of the typical Wilton type assemblages found in the more easterly Cape Folded Belt regions. Backed scrapers are the most dominant formal tool at BBF 4 and in this regard the site is similar to BNK 1 and Brakfontein.

At NBC, Oakhurst and Matjes River, situated to the east of BBF, backed scrapers are less common, or virtually absent, suggesting that Deacon's (1976) observation was correct. The reasons for the high frequencies of backed elements, particularly scrapers at BBF 4, BNK 1 and Brakfontein are not clear but may relate to differences in cultural affinities between the regions to the east and west, or to variations in the kinds of activities carried out in the various regions. The results also suggest that the activities at some coastal sites in the Mid-Holocene may not have been directed mainly at the utilisation of marine resources (*cf*. Klein 1973) but also at a range of other resources, perhaps terrestrial fauna, and that these animals were being specifically exploited. Unfortunately, a lack of well preserved faunal bone at BBF 4 precludes us from making any definitive statements about this hypothesis.

After the BBF 7 occupation at ca. 3000 B.P. a reduction in the number of formal tools is rapid at BBF sites, and appears to coincide with the presence of the first herders in this region at around 2000 B.P. As there is no evidence at BBC or BBF 9 of the kinds of retouched artefacts which were substituted for the earlier formal tools, it is difficult to gauge the extent to which the activities typical of the earlier sites were modified as a result of the arrival of herders. Unmodified flakes, particularly in quartz, were produced in large numbers at BBF 9 and it is possible these were the functional equivalents of some of the earlier retouched tools.

Bone tools are generally more common in the Late Holocene at a number of Cape coastal sites, but are also found in the pre-pottery period (cf. Grobbelaar & Goodwin 1952; Schweitzer 1974; Deacon, J. 1974; Schweitzer 1979; Schweitzer & Wilson 1982; Inskeep 1987); in some areas shell artefacts, in the form of scrapers and segments, may replace their earlier stone equivalents (Avery

1975, 1976; Brooker 1989). As no bone tools, apart from a spatula, came from any BBF sites it is not possible to speculate whether functional bone artefacts replaced the earlier stone tools. At BBC bone tools from the Middle Stone Age M2 phase dated at c. 77 000 years may have replaced the function of some stone tools and were possibly mounted as armatures. This is in contrast to the later c. 70 000 year phase where stone projectile points are more common, in particular the bifacial points in the Still Bay M1 phase. In the earlier >100 000 year M3 phase stone convergent flake points are also relatively common but there is no worked bone in this phase (Henshilwood *et al* 2001a,b).

Some changes in shellfish exploitation patterns are observable during the transitional pre- and post-2000 B.P. period at BBF (*cf*. Ch. 6) but due to a lack of preserved mammalian fauna in the pre-2000 B.P. sites the overall subsistence picture at BBF is incomplete (*cf*. Ch. 7). Changes in the location of sites at BBF may well be linked to the arrival of herders in the area; only near coastal caves and shelters are occupied after 2000 B.P. whereas prior to this period all sites are located in the elevated dune area or are open middens. An overview of the lithic changes, subsistence strategies and changes in site locations at around 2000 B.P. suggests that, at BBF, this was a period of considerable upheaval and adaptation to a new set of influences, hitherto not encountered by bands of hunter gatherers who had utilised this area during the Mid-Holocene.

Bone and shell artefacts are scarce at most BBF sites, but those recovered show affinity with similar artefacts from other coastal sites in the southern and south-western Cape. Bone tubes, for example, are reported from a range of sites, as are marine shell ornaments. A mean increase in the aperture of ostrich egg-shell beads occurs over time, and is particularly noticeable in the later sites BBF 7, 8 & 9; a similar trend is observed for many Cape sites with the largest beads occurring in sites attributed to herders (Yates. pers. comm.).

The relatively minor quantities of small pottery sherds from BBC and BBF 9 are not particularly informative as to the type or shape of vessels from which they originate. Finishes and methods of tempering are typical of Cape coastal pottery as described by Rudner (1968). There is a noticeable increase in the inclusion of crushed quartz, as opposed to rounded quartz, in pottery from the upper BBC layers, presumably an innovation which gave pots greater durability.

Pottery from BBC layer L5 dated at 1840 B.P. is contemporaneous with two sheep bones directly dated at 1880 B.P. and 1960 B.P., and confirms that the arrival of pottery and sheep in the BBF region were more or less simultaneous events.

CHAPTER 9

SEASONALITY AND OXYGEN ISOTOPE ANALYSIS

9.1: Introduction

Determining whether prehistoric coastal sites were occupied occasionally, for long periods, and in what season is of significant interest in mapping the movement of ancient populations. Archaeological research programmes on shell middens in the United States, Australia, Europe and South Africa have examined the issue of seasonality from a number of perspectives. One of the most promising techniques for determining seasonality, namely oxygen isotope analysis of marine shell carbonates, was first applied by Shackleton (1973, 1982) using two shells excavated from Nelson Bay Cave in the southern Cape. This study demonstrated that both shells were collected during winter. Application of the same technique to shells from coastal middens in Spain (Deith & Shackleton 1986) and California (Killingley 1981) has subsequently yielded valuable seasonal information.

Seasonal movement of indigenous hunter gatherer populations between the littoral and inter-montane zones of the Cape during the Holocene, and possibly earlier, has been a recurrent theme of archaeological research in the Cape since the 1960s (e.g. Wells 1965; Deacon, H.J. 1969,1976; Parkington 1972, 1976, 1977, 1991, 2001; Shackleton 1973; Klein 1973; Avery 1974; Buchanan *et al* 1978; Deacon & Deacon 1999; Mitchell 2002) but the topic is not without its controversies (Sealy 1989; Sealy & van der Merwe 1992; Sealy *et al* 2000; Jerardino *et al* 2000). The basis of a transhumance argument is one of maximising seasonally available and reliable staple resources; the best collecting opportunities for carbohydrate rich corms, bulbs and tubers can occur inland during the summer months; coastal shellfish foods offer a dependable source of protein in winter. A wide range of additional foods, in both locales, were obtained from strategies employing hunting, trapping and gathering but were probably less reliable.

However, only a few of the remains found in archaeological sites in the Cape provide reliable pointers to the season of occupation. Some sites suggest, based on human dietary evidence, that movement between the coast and inland was not a regular occurrence, at least in the south-western Cape (e.g. Jerardino *et al* 2000; Sealy *et al* 2000).

Oxygen isotope analysis of modern shells collected from the inter-tidal zones adjacent to BBF and of archaeological marine shells excavated from BBF sites/units provides a method for determining the season of occupation of BBF sites during the Holocene.

9.2: Basic Principles of Oxygen Isotope Analysis

Development of the basic techniques of oxygen isotope analysis of marine shells are described in Urey (1947) and McCrea (1950). The technique for determining the season of collection of shells from archaeological assemblages using this method is well established (Shackleton 1973; Killingley 1981; Deith & Shackleton 1986; Jones & Quitmyer 1996; Keene 2004), as are the limits and potential of the method (Bailey *et al* 1983; Goodwin *et al* 2001). A brief summary of the method is given here.

Oxygen in the atmosphere is comprised of three naturally-occurring stable isotopes, ^{16}O, ^{17}O and ^{18}O in the ratio 3000:1:6. The ^{18}O abundance ratio varies by up to 10% depending on the constituent in which it is present. A variation in this ratio will be present in sea water. During shell growth calcium carbonate is precipitated from sea water; the ratio in the precipitate is determined both by the ratio in the sea water and by a small isotopic discrimination based on temperature. A depletion of approximately 0.2 ‰ will occur for each 1º C rise in water temperature. Varying temperatures in the shell carbonate of an ocean mollusc will record the changing seasons. The season of death will be indicated by the value at the growing edge.

Carbon dioxide present in the shell carbonate is released by reacting the carbonate with 100 % orthophosphoric acid at 50º C after removal of contaminants. A mass spectrometer compares the ratio of ^{16}O to ^{18}O in the sample with that of a standard gas of known composition. Deviation of the sample from the standard in parts per thousand is expressed as the delta value (δ). In stable conditions of salinity a higher ratio of ^{18}O to ^{16}O indicates a colder environment at the time of deposition and vice-versa.

9.3: Current Problems in Seasonality Research in South Africa.

There have been many approaches to the problem of reconstructing seasonality at Cape coastal sites. Much of the evidence is circumstantial and derives from ecological modelling (e.g. Buchanan *et al* 1978; Henshilwood *et al* 1994; Parkington 1991), ethnographic analogy and oral traditions (*cf.* Deacon 1969, 1976). Some direct evidence is provided by biological indicators, namely plant remains at inland sites (e.g. Wells 1965; Deacon, H.J. 1976), by deriving 'time of death' from seal and hyrax dental patterns (*cf.* Parkington 1991, 2001; Smith & Woodborne 1994), and by the analysis of .human bones to determine dietary intake and hence movement across the landscape (Sealy & van der Merwe 1985, 1992; Sealy *et al* 2000; Jerardino *et al* 2000).

Stable carbon and nitrogen isotope measurements on human bone recovered from archaeological sites reflect the long term diets of the inhabitants. An analysis of bone from a burial at Steenbokfontein, south-western Cape coast, show a diet rich in marine foods suggesting limited, if any seasonal movement between the coast and inland (Jerardino *et al* 2000). A similar analysis of three juvenile skeletons recovered from a burial in the inland Clanwilliam district indicate their diets were based on terrestrial foods. The authors indicate the results clearly distinguish these children's diets from those of coastal peoples of the same period (Sealy *et al* 2000).

Previous Research :

Careful oxygen isotope measurements made on carbonates in the edge of the shell and in sequential growth increments provide the means to determine the season of death of the organism and hence the time of collection by prehistoric people.

1. Two *Scutellastra tabularis* shells analysed from early Holocene deposits at Nelson Bay Cave showed that both shells were collected during the winter months (*cf.* Shackleton 1973).

2. Oxygen isotope analysis of *Turbo sarmaticus* opercula from the Middle Stone Age levels at Klasies River Mouth provided palaeotemperature curves for oxygen isotope stratigraphic correlation. Due to the poor condition of the opercula edges the results could not be used to determine seasonality (Shackleton 1982).

3. Specimens of *Turbo sarmaticus* opercula from the Middle Stone Age layers at Klasies River Mouth were analysed in 1986 but the results are unpublished. (Thackeray pers. comm.). to be checked

9.4: Objectives of the BBF seasonality study

The objectives of the BBF seasonality study were:

1. Determining which species of shellfish are suitable for seasonality studies. Past research was taken into account in addition to experimenting with modern shellfish samples. Two species were selected, namely *S. tabularis* and *T. sarmaticus*. Modern specimens of these species were collected by the author at various locations on the coast to the south of BBF at regular intervals during 1993 and 1994 for isotopic testing.

2. To select samples of *S. tabularis* and *T. sarmaticus* opercula during the excavation of BBF sites which were suitably preserved for seasonality studies. These were taken to the Godwin Laboratory, Cambridge for preparation and for oxygen isotope analysis on the mass spectrometer.

9.5: Methodology and Results: *Turbo sarmaticus*

1. Modern samples:

Twenty two live *Turbo* specimens were collected at Blombos on 22/6/93 and fifteen specimens on 1/1/93. The opercula were removed, cleaned and dried.

Two methods were adopted to collect carbonate samples from the opercula.

Method 1: In the Godwin laboratory the leading growth edge of each opercula (see Fig. 9.1) was lightly burred and a carbonate powder sample of between 1 mg and 3 mg collected. Each sample was loaded into individual pyrex boats and roasted under vacuum for 1 hour at 450 ^{o}C to remove the organic matrix. Batches of 20 samples were loaded into the mass spectrometer for measurement of the isotopic ratio.

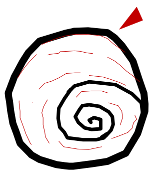


Fig. 9.1: Position of leading growth edge on *Turbo* opercula

Method 2: A series of holes were drilled used a 1 mm diamond-tipped drill bit at approximately 2 mm intervals, starting at the leading growth edge and ending at the edge of the inner vortex of the opercula (Fig. 9.2). The collected carbonate was processed, as described above, for measurement of the isotopic ratio.

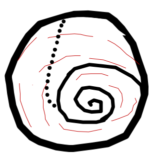


Fig. 9.2: Drill pattern for *Turbo* opercula

2. Samples from BBF sites:

Turbo opercula were selected from each of the excavated BBF sites and cleaned and dried in the Godwin Laboratory. Both methods, described above for modern opercula, were adopted to obtain carbonate samples from the archaeological specimens and for measurement of the isotopic ratio.

Results:

As the intra-annual variability in sea surface temperature is highly seasonal at Still Bay (Fig. 9.11), *Turbo sarmaticus* (Thackeray pers. comm.) and *Scutellastra tabularis* are well suited to determining seasonality from the oxygen isotope analysis of their marine carbonates (*cf.* Cohen & Branch 1995). The cyclicity in temperature variations is well demonstrated by the results from modern *Turbo* opercula plotted in Fig. 9.4.

In the case of *Turbo* opercula, which are mainly aragonitic in composition (Cohen pers. comm.; Thackeray pers. comm.), Shackleton's (1974) palaeotemperature equation (given below) shows that the minimum and maximum δ^{18}O values are enriched by approximately 0.7 $^{o}/_{oo}$ relative to those expected for calcite/aragonite equilibrium precipitation from sea water with a δ_w value of 0.3 $^{o}/_{oo}$. (*cf.* Cohen & Branch 1995)

$T = 16.9 - 4.4 (\delta_c - \delta_w) + .10 (\delta_c - \delta_w)^2$

Using Shackleton's palaeotemperature equation, and allowing for an enrichment of 1 ‰ for *Turbo* relative to estimated sea surface temperatures at Still Bay, the $\delta^{18}O$ values obtained from the BBF *Turbo* opercula were converted to sea surface temperatures (°C) and are plotted in Figs. 9.3 - 9.10.

Modern Turbo opercula (Figs. 9.3 & 9.4)*:*

Isotopic ratios based on opercula edge values plotted in Fig. 9.3 demonstrates a clear distinction between *Turbo* collected in mid-summer and those collected in mid-winter. In the case of the former, the temperature range is between 22 °C - 20 °C and the latter between 17.5 °C - 14.5 °C. It is important to note that samples burred from the leading growth edge of *Turbo* opercula are likely to include carbonate material from at least the previous one or two months growth, particularly in large opercula which grow more slowly, and this factor should be taken into account when calculating the season of death of the animal. Growth in the summer months is also likely to be faster than during winter (Yssel 1989).

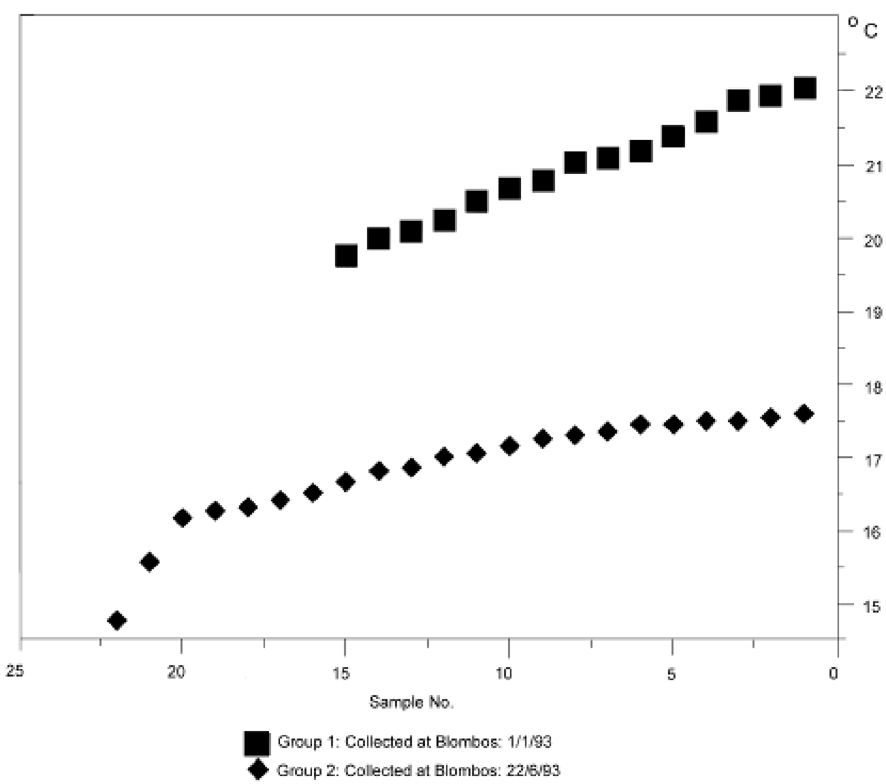


Fig. 9.3: Turbo sarmaticus: modern opercula edge values expressed as sea temperature

Fig. 9.4 shows the cyclicity in sea surface temperatures recorded for six modern opercula. The first three samples on the graph were collected in mid-winter and the edge values fall within the expected temperature range for that season (also *cf.* Fig. 9.11). Conversely, the three samples collected in mid-summer fall within the summer temperature range as reflected in Fig. 9.3. Figs. 9.3 and 9.4 demonstrate that edge value isotopic ratios from modern *Turbo* opercula consistently reflect the season in which they were collected

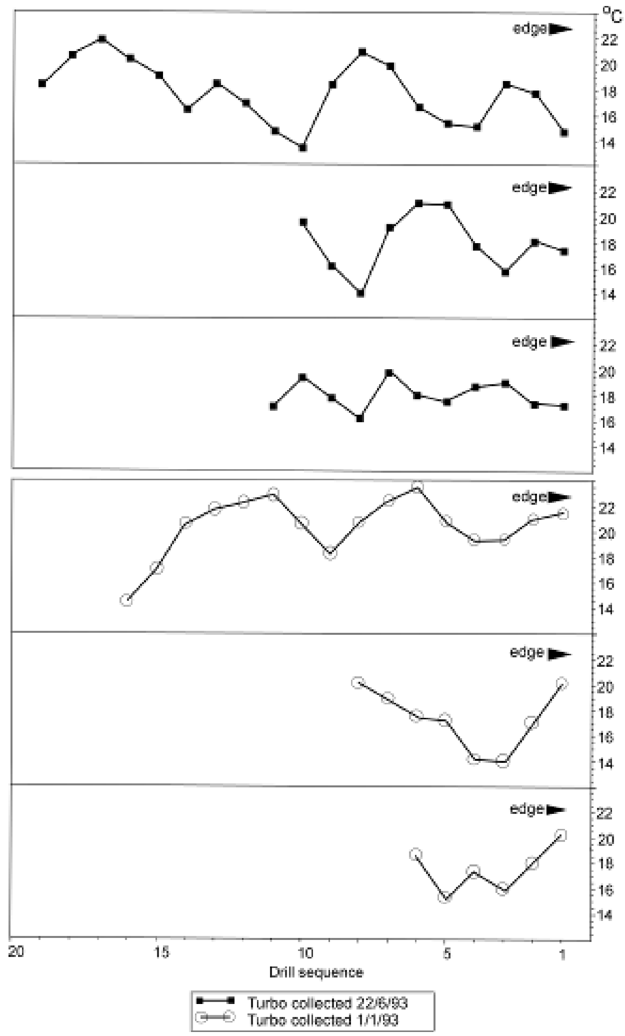


Fig. 9.4: *Turbo sarmaticus*: modern opercula: sequential values expressed as sea temperature

Archaeological Turbo opercula:

Sites BBF 1-5 (Fig. 9.5)

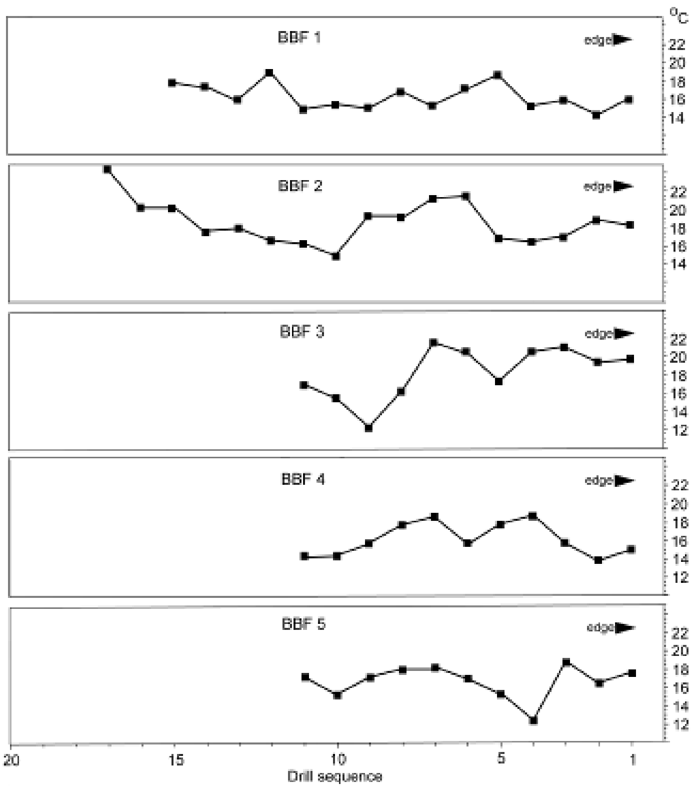


Fig. 9.5: Turbo sarmaticus opercula: Sites BBF 1-5: sequential values expressed as sea temperature

One *Turbo* opercula from each of the sites BBF 1 - 5 was analysed using Method 2, described above. The results are plotted in Fig. 9.5 and show that seasonal variation in sea temperatures are recorded in the carbonate of opercula growth rings. However, the spacing between seasonal growth rings is frequently less than 1 mm meaning that carbonate from more than one seasons growth may be obtained when using a 1 mm drill-bit. If a smaller drill-bit is used the size of the carbonate sample collected is less than 1 mg and hence too small for processing. Problems were also experienced when drilling the first hole on the leading growth edge of the opercula as the carbonate from more than one seasons growth is generally included in the sample giving a misleading time of the season of death of the animal. The edge values from BBF 1 and 4 suggest collection in winter, BBF 2 and 5 are intermediate and point to spring or autumn temperatures. The sample from BBF 3 appears to have been collected during summer but the result does not agree with that of the edge values of other *Turbo* opercula from the site (Fig. 9.6) and is probably inaccurate.

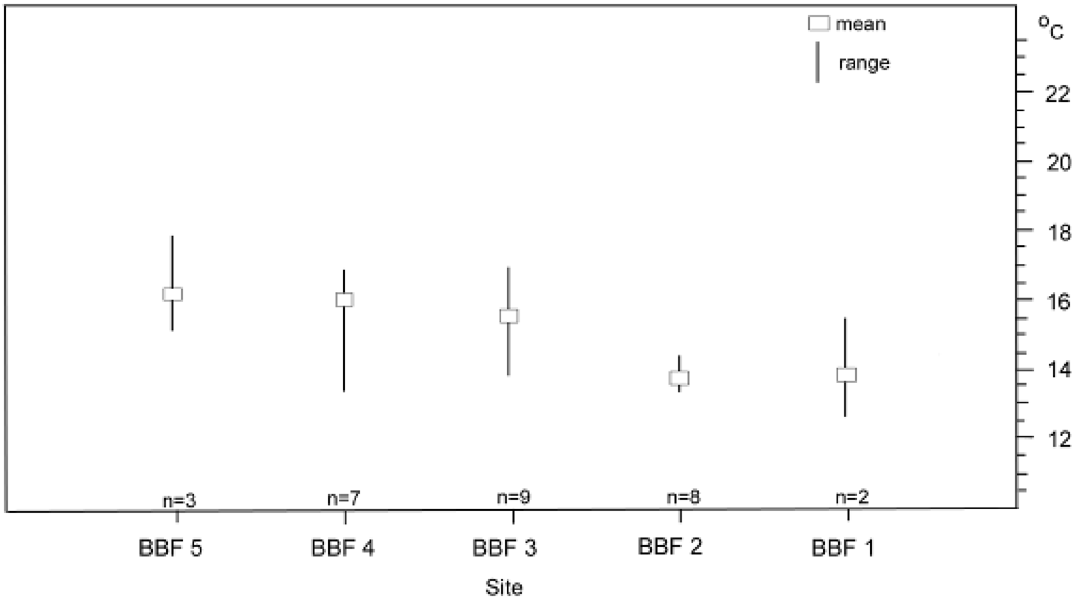


Fig. 9.6: Turbo sarmaticus opercula: BBF 1-5: edge values expressed as sea temperature

Sites BBF 1 - 5 (Fig. 9.6):

Fig. 9.6 reflects the mean sea surface temperature at the time of death of the *Turbo* samples from the sites BBF 1 - 5 dating to between 6960 B.P. and 5520 B.P. Isotopic ratios are determined from edge values of *Turbo* opercula. An analysis of *S. tabularis* samples collected from Nelson Bay Cave by Cohen and Branch (1995) shows that during the period 6300 B.P. - 5000 B.P. summer temperatures on the southern Cape coast were similar to those of the present day. Both the means, and the ranges for the samples from the BBF 1 - 4 sites fall within the expected sea surface temperatures for the winter months suggesting that these sites were all occupied between May and October. BBF 5 may have been occupied during the early summer months i.e. November or December (*cf*. Fig. 9.11).

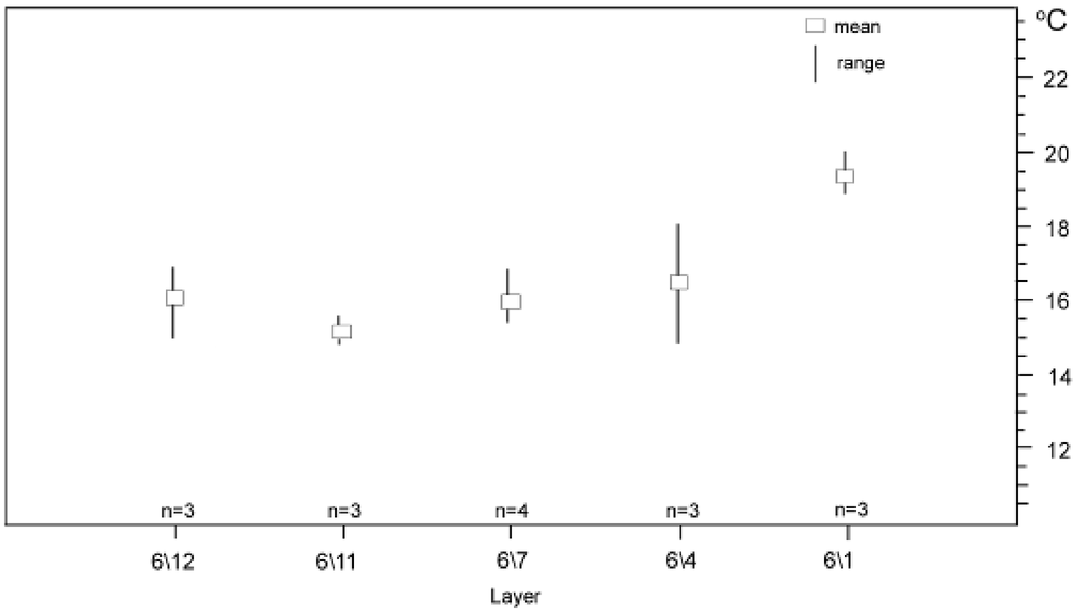


Fig. 9.7: Turbo sarmaticus opercula: BBF 6: edge values expressed as sea temperature

BBF 6 (Fig. 9.7):

The BBF 6 layers are dated between 4070 B.P. and 3630 B.P. Although there is isotopic evidence of a general cooling trend after 4300 B.P. (*cf.* Cohen & Branch 1995) the mean and range of sea temperatures from the layers 6\4, 6\7, 6\11 and 6\12 all suggest winter occupation. The exception is layer 6\1 with a mean temperature of 19.5 ºC suggesting this unit was deposited during the summer months, possibly between November and January.

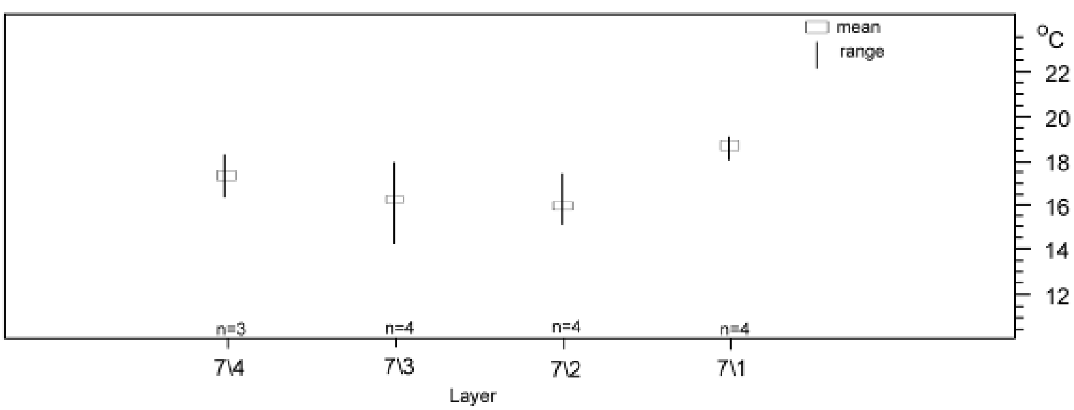


Fig. 9.8: Turbo sarmaticus opercula: BBF 7: edge values expressed as sea temperature

BBF 7 (Fig. 9.8):

Maximum sea surface temperatures for the summer months at Nelson Bay Cave (ca. 3000 B.P.) are calculated as approximately 1 ^{o}C cooler than today (Cohen & Branch 1995). The isotopic ratios from Layers 7\2, 7\3 and 7\4 suggest occupation during the winter months. Layer 7\1 opercula reflect a mean sea temperature of 19 ^{o}C suggesting early summer occupation, possibly between November and January.

BBC (Fig. 9.9):

Sea surface temperatures calculated from opercula obtained from Layers 1 - 6 at BBC fall between 14 ^{o}C and 18 ^{o}C suggesting that all layers were occupied during the colder months, possibly between autumn and spring. Layers BBC L1, L3 and L6 were probably occupied in the mid-winter months, i.e. June - August, and BBC L2, L4 and L5 in autumn or spring.

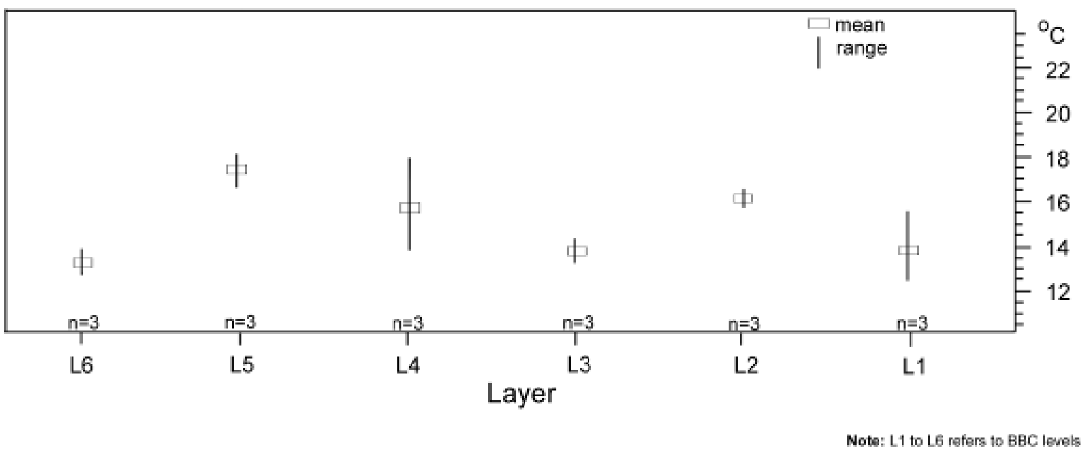


Fig. 9.9: Turbo sarmaticus: BBC: edge values expressed as sea temperature

BBF 9 (Fig. 9.10):

The seasonal range of sea surface temperatures at Nelson Bay Cave at around 650 B.P., the start of the Little Ice Age, are the smallest recorded during the Holocene, i.e. between 19 ^{o}C and 15.5 ^{o}C (Cohen & Branch 1995). BBF 9 was occupied at around 480 B.P. and the range for the 12 opercula analysed from this site falls between 13.5 ^{o}C and 15.8 ^{o}C, with a mean of 15 ^{o}C strongly suggesting a mid-winter occupation, probably between June - August.

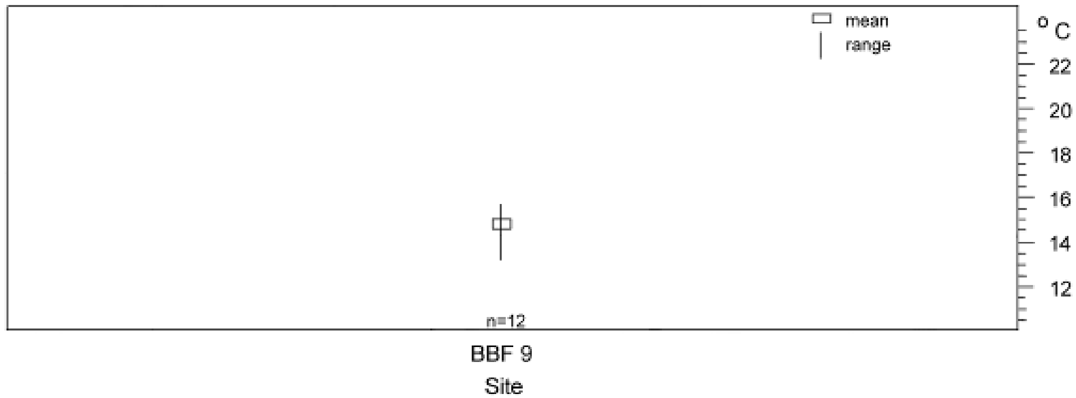


Fig. 9.10: Turbo sarmaticus: BBF 9: edge values expressed as sea temperature

9.6: Methodology and Results: *Scutellastra tabularis*

1. Modern samples:

Two live *S. tabularis* specimens were collected at Blombos on 1/1/93 The shells were scrubbed to remove surface algae and dried. The whole shells were sectioned longitudinally along one of the shell ridges and the exposed surface polished. Holes were drilled using a 1 mm diamond-tipped drill-bit at 2 mm intervals along the inner calcitic layer from the shell edge to the apex. Carbonate samples of between 1 mg and 3 mg were roasted in individual pyrex boats for one hour to remove the organic matrix. Batches of 20 samples were loaded into the mass spectrometer at the Godwin laboratory, Cambridge for measurement of the isotopic ratio (*cf.* Shackleton 1973; Cohen and Branch 1995).

2. Samples from BBF sites:

Due to limited time available on the mass spectrometer, and the cost involved, it was only possible to analyse one *S. tabularis* shell from each of the sites BBF 1 -5. Carbonate from archaeological samples were collected and processed in the manner described above for modern *S. tabularis* in order to obtain isotopic ratios.

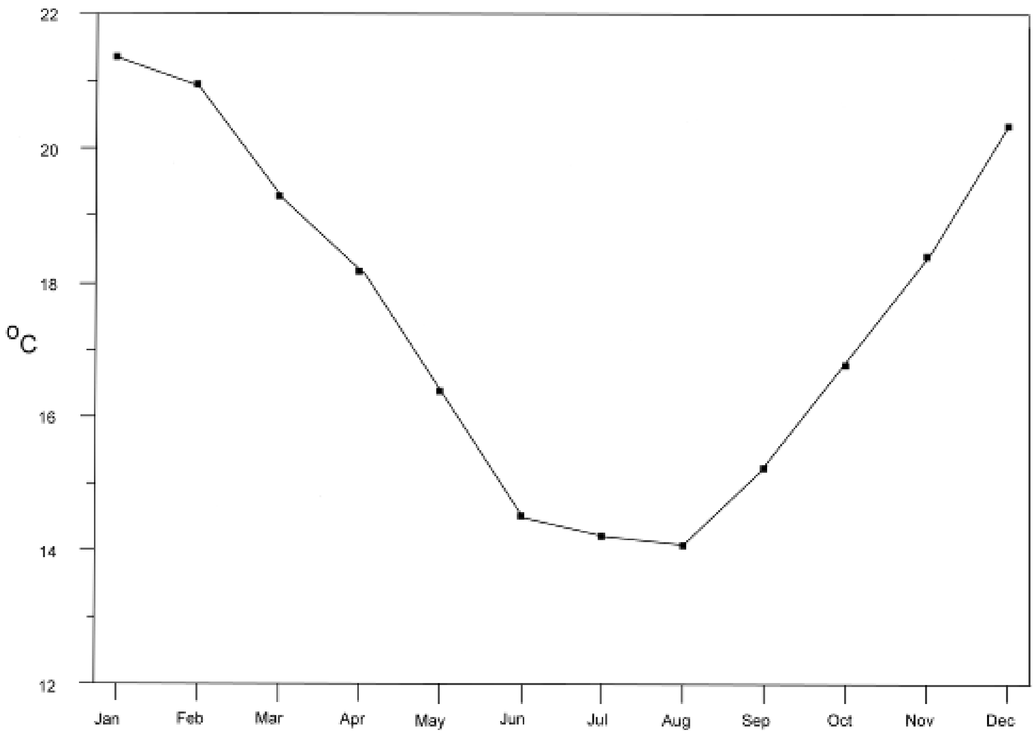


Fig. 9.11: Still Bay: mean sea surface temperatures: 1983-1992.

Results:

Sea surface temperatures were calculated from $\delta^{18}O$ values for *S. tabularis* shells using Shackleton's (1974) palaeotemperature curve allowing for a positive enrichment in minimum and maximum values of 0.7 $^{o}/_{oo}$ and a δ_w value of 0.3 $^{o}/_{oo}$. The results obtained from the analysis of the modern and archaeological *S. tabularis* shells are plotted in Figs. 9.12 and 9.13.

Modern S. tabularis shells (Fig. 9.12).

The two modern *S. tabularis* shells demonstrate the cyclicity expected from seasonal variations in sea surface temperatures. Lowest temperatures of around 14 ^{o}C coincide with mid-winter months and the highest, at around 21.5 ^{o}C, with mid-summer and agree with the mean sea surface temperatures recorded at Still Bay in Fig 9.11. Although the modern *S. tabularis* samples accurately reflect the temperature range, only Sample 1 is a reliable indicator of the season of death reflecting an edge value of 18.8 ^{o}C, whereas Sample 2, with an edge value of 15.5 ^{o}C, suggests collection in mid-winter. Obtaining a carbonate sample from the leading growth edge of Sample 2 presented problems as the calcitic layer was very narrow. It is likely that some carbonate from previous months of growth was also sampled so producing a rather anomalous result. A similar problem was encountered in taking edge samples from archaeological specimens of *S. tabularis*, particularly where the ridged edge of the shell had been worn due to exposure.

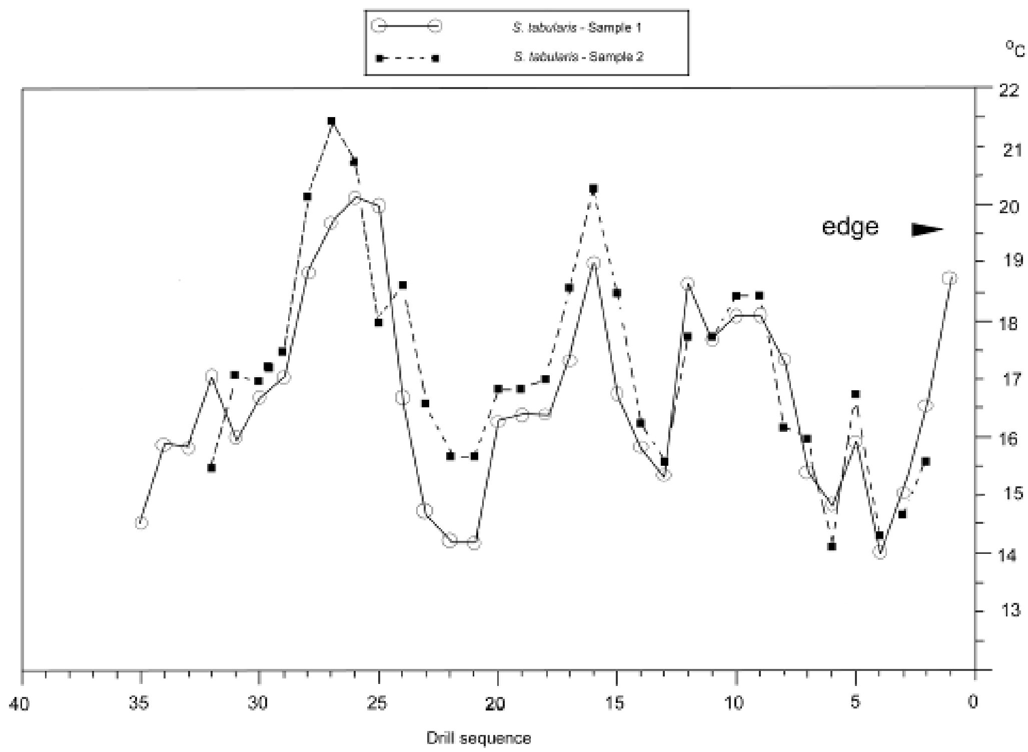


Fig. 9.12: Scutellastra tabularis: Isotopic temperatures: modern samples collected at Blombos 1/1/93

Archaeological S. tabularis samples (Fig. 9.13):

The shell from BBF 1 reflects a temperature range between 21.5 °C and 13.5 °C suggesting conditions similar to today. A temperature of 13.5 °C at the shell edge suggests the animal was collected in winter and agrees with the results obtained from *Turbo sarmaticus* specimens.

Due to algal borings and surface wear a complete range of carbonate samples could not be obtained from the shell from BBF 2. However, the edge value of 15 °C is similar to the results obtained for *Turbo* opercula from the site and confirms the suggestion that the site was occupied during the winter months.

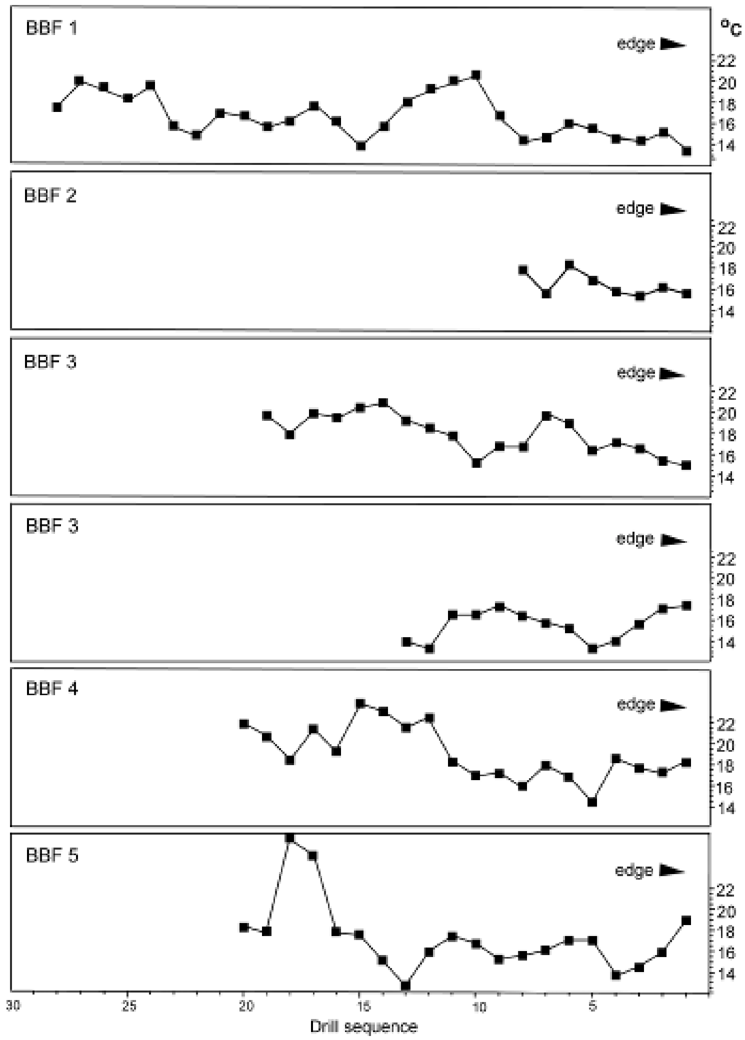


Fig. 9.13: Scutellastra tabularis: BBF 1-5: Isotopic temperatures

Two shells were sampled from BBF 3. One shell reflects a seasonal temperature range of between 21.5 °C and 14 °C while the other records a maximum sea temperature of 18 °C and a minimum of 14 °C. The variation between the edge values of the two samples is 2.5 °C, i.e. 15 °C and 17.5 °C. Both edge values rule out summer occupation at the BBF 3 site and agree with the *Turbo* opercula results suggesting collection in spring or autumn.

The BBF 4 shell suggests higher summer sea temperatures of around 22 °C - 23 °C with winter temperatures of 14 °C. An edge value of 18 °C suggests occupation during spring or autumn.

Anomalously high summer temperatures are recorded in the shell from BBF 5 although winter temperatures are around 14 °C which is similar to the results from BBF 1 - 4. Both the *Turbo* opercula and *S. tabularis* edge results suggest the site may have been occupied during the early months of summer.

9.7: Summary

Seasonal variation in sea surface temperatures in the Still Bay area are reflected in the carbonates of *Scutellastra tabularis* and *Turbo sarmaticus* opercula. Modern samples of *S. tabularis* and *T. sarmaticus* collected in the Blombos area were analysed using the basic techniques of oxygen isotope analysis (*cf*. Urey 1947; McCrea 1950) to confirm that the method for establishing the season of collection of shells, proposed by Shackleton (1973), could be applied to shellfish collected in the BBF area. The results obtained from both species of shellfish demonstrate the accuracy of establishing the season of death of the animal from shell carbonates. The most accurate results were obtained by lightly burring the leading growth edges of *Turbo* opercula and subsequently analysing the sample obtained for measurement of the isotopic ratio. $\delta^{18}O$ values for both *T. sarmaticus* and *S. tabularis* were converted to sea surface temperatures (^{o}C) using Shackleton's (1974) palaeotemperature formula allowing for enrichment of the minimum and maximum values of approximately 0.7 $^{o}/_{oo}$ and a δ_w value of 0.3 $^{o}/_{oo}$.

Turbo opercula and *S. tabularis* shells were collected during excavations at each of the BBF sites for oxygen isotope analysis at the Godwin Laboratory, Cambridge. The results obtained from edge value isotopic ratios of *Turbo* opercula and *S. tabularis* show that the sites BBF 1 - 4 were occupied during the winter months, possibly between May and October. BBF 5 was probably occupied during the early summer months as was layer 6\1 at BBF 6. Layers 6\4, 6\7 , 6\11 and 6\12 were all deposited during winter. At the BBF 7 site, the results from lower layers, 7\2 - 7\4 all suggest winter occupation although the top layer 7\1 was probably deposited during the early summer months between November and January.

No summer occupations are reflected in the results obtained from BBF sites which post-date 2000 B.P. At the BBC site layers L1, L3 and L6 were probably occupied during the mid-winter months and Layers L2, L4 and L5 during spring or autumn. BBF 9 results strongly indicate mid-winter occupation, probably between June and August. If Khoekhoe pastoralists were present in the BBF area then the most suitable time for grazing stock at the coast would have been during winter (cf. Blommaert & Wiid 1937; Mandelbrote 1944). As the occupants of the BBC and BBF 9 sites are not regarded as pastoralists (*cf*. Ch. 8) it seems that the seasonal round of hunter gatherers making use of coastal resources here during the winter was not disrupted, possibly due to a limited presence of herders in the BBF area or because there was no threat to hunter gatherer bands in the BBF area from Khoekhoe herders.

The overall pattern for the occupation of BBF sites between 6960 B.P. and 480 B.P. is strongly biased towards occupation during autumn, winter or spring suggesting that throughout this period the seasonal pattern of coastal occupation remained fairly constant. It is interesting to note that two of the sites which indicate summer occupation, i.e. BBF 5 and Layer 6\1 at BBF 6 are both regarded as shellfish processing sites and not 'occupation sites' suggesting that coastal resources may, at times, have been opportunistically used during the summer months, perhaps while passing through the area, but that coastal occupations were rare during summer. BBF 7, Layer 7/1, may be regarded as an exception to the rule as this is regarded as an 'occupation site' and was deposited during the early summer, possibly between November and January.

CHAPTER 10

SUMMARY & DISCUSSION

10.1: Summary

The final conclusions of the BBF project attempt to address most of the issues raised in previous chapters and are presented in two sections. The first is a brief synopsis of the findings from each of the sites excavated, roughly divided into time periods, and the second considers the major issues raised in each of the chapters, although the discussions frequently overlap and are therefore not strictly presented in chapter order.

10.2: Site Synopses

The nine sites in the BBF area are divided into 3 site types based on age and location. Type 1 sites predate 2000 B.P., are located in the dune area of the BBF coastal foreland and are all open sites, either single or multiple occupation, One exception is the BBF 5 site which was not 'occupied', i.e. was not a camp site, but was used for processing shellfish, perhaps for one day only, and then abandoned. The minimum elevation of these sites is 90 m a.s.l. and the maximum 165 m a.s.l. There is only a single Type 3 site, BBF 6, which dates to around 4000 B.P. and is an open site situated on a rocky promontory directly adjacent to the sea. BBF 6 is essentially a large shell dump containing a minimum of cultural artefacts and bone. Twelve discrete depositional units were recognised at the site and on the basis of the content of these layers BBF 6 is designated a shellfish processing or extraction site. Type 2 sites post-date 2000 B.P., are located in shelters situated in the coastal cliffs to the south of the dune area and are less than 100 m from the sea. There are two Type 2 sites, BBC & BBF 9, the former is a multi-occupation site and the latter was occupied once only. The Type 2 sites post-date the arrival of the first pastoralists in the BBF area.

Note: Sites are described below in chronological order i.e. Type 1, Type 3 and then Type 2.

1. Type 1 Sites:

Type 1 sites are located in the elevated dune area of the BBF coastal foreland and pre-date 2000 B.P.

ca. 7000 - 6700 B.P.

BBF 1 & 2 (Figs. 5.2, 5.3, 5.4, 5.5, 5.6, 5.7)

Both BBF 1 & 2 are single occupation sites of similar size. The extent and volume of deposit at BBF 1 suggests it may have been occupied for a week or two, BBF 2 may only have been used for a few days. An estimate of group size at each site is between 10 - 20 people. Warm and moist coastal conditions, with increasing summer rainfall and a possible decrease in winter rainfall at this time probably means the BBF dunefield was stable and forested (*cf.* Martin 1968; Helgren & Butzer 1977; Cockroft *et al* 1987; Deacon & Lancaster 1988; Tyson & Lindsay 1992; Cohen & Tyson 1995; Scott 2002; Barrable *et al* 2002; Carr eta la 2006; Chase & Meadows 2007; Chase & Thomas 2007). Two species of shrubs in particular *Syderoxylon inerme* and *Euclea racemosa,* both well known for their extensive canopy and spreading branches, would have provided congenial areas, protected from the elements, to set up camp (van Breda & Barnard 1991).

Sea levels gradually rose during the early Holocene (Bloom 1979; Ruddiman & Duplessey 1985; Compton 2001; Carr *et al* 2006) and between 7000 - 6000 B.P. the sea levels on the BBF coastline may have been similar to today or slightly higher, possibly + 1-1.5 m (*cf.* Birch 1976; Flemming 1977; Miller *et al* 1993).

In any event, a range of shellfish were exploited by the sites inhabitants and the lists of the five most common species found at BBF 1 & 2 are almost identical. In descending order of magnitude these are *T. sarmaticus, P. perna, H. spadicea, S. longicosta* and *C. oculus*. Two of these species, *T. sarmaticus* and *H. spadicea* occur only in the Cochlear and Infratidal zones suggesting they were collected during low water at spring tide. Although the largest mean sizes of *T. sarmaticus* are found at BBF 1 & 2 , the mean size of *P. perna* from the BBF 2 site are the smallest of all the BBF sites. Of the five species of shellfish measured from all sites there is a definite trend indicating that three of the species are generally larger in the earlier sites, but that *P. perna* and *H. spadicea* are smaller (*cf.* Ch. 6).

The assemblages from both sites were encased in breccia and during excavation it was noted that although bone was common at both sites it was very friable and could subsequently not be identified to taxa. However the presence of bone and numerous lithic artefacts suggests that a range of activities, in addition to shell-fishing, were performed at BBF 1 & 2. Retouched stone tools, all in silcrete, are common at BBF 1 but rare at BBF 2. In keeping with the general trend observed during the early stages of the Wilton Tradition at other Cape sites, scrapers are larger than those from Mid-Holocene sites. Backed pieces, including backed scrapers and segments are already apparent at BBF 1 at around 7000 B.P. and make up 44 % of the retouched artefacts pointing to an early start at BBF for the manufacture of backed tools. A distinct contrast between the lithics from BBF 1 & 2 is the high proportion of waste quartz, hammerstones and grindstones at the latter site suggesting that the range of activities involving lithic artefacts was not the same at both sites.

The results of oxygen isotope analysis on shell carbonate tested from BBF 1 & 2 indicate that both sites were occupied during the winter months, possibly between May and October. It seems likely that coastal sites such as these formed only a part of a possibly much larger seasonal round and were occupied for only brief periods during the year. Although one of the main objectives of visiting this section of the coastline may have been to gather shellfish, it is likely that a range of other resources were also exploited in the surrounding area.

ca. 6000 - 5500 B.P.

BBF 3 (Figs. 5.2, 5.8, 5.9)

Almost 800 years separates the occupation of BBF 2 and BBF 3. Whether the BBF area was occupied during this period cannot be established from the limited number of sites that were excavated. There does seem to be an hiatus in occupation at Byneskranskop 1 at around the same period (Schweitzer & Wilson 1982) and possibly at Nelson Bay Cave (Inskeep 1987) but this may be a function of insufficient radiocarbon dates or simply that we have not yet located any sites which date to this interim. A rapid rise in sea level is possible at around 6000 B.P. and may have temporarily reduced the amount and range of marine resources available for exploitation.

BBF 3 is a single occupation site covering around 900 sq. m and therefore considerably larger than BBF 1 & 2. Three discrete depositional areas on the perimeter, possibly linked in the past to the positions of shelters, and a central hearth area point to a layout typical of many hunter gatherer camps. Judging from the extent and depth of the deposit at BBF 3, the size of the band occupying this site was probably larger than at the earlier sites, BBF 1 & 2, but the camp may not have been occupied for longer than a week or two. Protection from the elements would have been provided by well vegetated surroundings.

The available range of shellfish at BBF after 6000 B.P. seems unaffected by the proposed higher sea levels and a similar mix of species is found at BBF 1, 2 & 3. There is a slight shift in emphasis towards greater exploitation of *S. tabularis* and *Diloma sp*. but *T. sarmaticus* remains the most commonly exploited mollusc and suggests that the BBF 3 inhabitants were exploiting the full range of the intertidal zone. A part of the occupation must therefore have coincided with a spring tide.

A large amount of tortoise and fragmented bovid bone was apparent on the surface of the partially brecciated assemblage pointing to activities at the site other than shell-fishing. During recovery the larger bovid bone was found to be very friable and could not be classified to taxa. The numbers of waste and modified/utilised lithic artefacts were very low, similarly retouched stone tools were rare and consisted of a few scrapers in silcrete and a single backed flake in quartz suggesting minimal activities relating to the use of lithic artefacts were carried out at the site. Analysis of shell carbonates from the site indicates occupation during winter, possibly between May and October.

BBF 4

The most distinguishing features of the BBF 4 site are its size and the large numbers of lithics visible in the deposit. In total, the site extends over 2500 sq. m, of which 400 sq. m is *in situ*. Three distinct areas of high density deposit encircle a central area containing a light scatter of shell (Fig. 5.11) and the overall layout of the site is similar to that at BBF 3 (Fig. 5.8). However, the size of BBF 4 points to occupation by a larger band than is proposed for BBF 3, possibly 30 - 40 people. The high incidence of formal tools at BBF 4, numerous traces of ochre on upper and lower grindstones and its size and layout suggests it may have been an aggregation site (*cf.* Wadley 1989) where a number of smaller bands gathered to exchange ritual *hxaro* gifts and for social interaction.

At the time of occupation the dunefield was probably well vegetated and as the site is situated in a low-lying area of the dunes it probably afforded protection from the northerly and westerly winds. Although a + 2 m high sea stand is predicted for the mid-Holocene (*cf.* Ch. 2) this does not seem to have affected the shellfish resources on the rocky coast below BBF. The five most common shellfish species at BBF 5 are very similar to those found at BBF 3 and include, in descending order, *T. sarmaticus, S. longicosta, Diloma sp., C. oculus* and *S. tabularis. Patella sp.* feature strongly at the BBF 4 site, unlike BBF 1 & 2 where *P. perna* and *H. spadicea* are common. It seems more likely that this change in species preference was out of choice, rather than due to availability, as overall the range of shellfish exploited at BBF 4 is the same as that at BBF 1 & 2, but in different proportions. The whole range of the intertidal zone was exploited by the BBF 4 inhabitants indicating that part of the occupation period coincided with low spring tide. Oxygen isotope analysis of shells from the site shows occupation during autumn, or winter, or early spring.

Fragmented bone was scattered throughout the deposit but the few whole bones present were too friable for recovery. Two mandibles containing teeth were identified as *Taurotragus oryx.* Despite the lack of identifiable bone, it is obvious from the lithics that activities at the site extended beyond those relating only to shellfish. Almost 3500 unmodified artefacts were recovered, 77 % in silcrete, indicating extensive stone knapping activity. Backed artefacts, mainly backed scrapers, account for 76 % of the retouched artefact category and point to the extensive use of hafted tools at the BBF 4 site. If we assume that backed tools were used in the processing of animal carcasses (*cf.* Ch. 8), then the 139 backed scrapers, 50 backed segments and 47 backed flakes suggest intensive activity revolving around meat and hides.

A clear distinction can be made between typical Wilton tradition assemblages from sites to the east of the Gouritz River, dated at around 5000 B.P., and the lithics from BBF 4. These differences support H.J. Deacon's (1976:171) contention that 'west of these limits (the Gouritz River) there would seem to be artefact occurrences... which fall outside any concept of a specific Wilton content unit'.

BBF 5 (Figs. 5.2, 5.12, 5.13)

The BBF 5 site dates to around the same period as BBF 4 but clearly the site was used for a very different purpose. BBF 5 consists of a thin scatter of shell and stone covering 550 sq. m on the slope of a stabilised dune and a core area of dense deposit of 18 sq. m. Two species, *T. sarmaticus* and *S. tabularis,* account for 70 % of the shellfish assemblage. Formal stone tools are almost absent and the modified lithics class is dominated by 11 hammerstones, and 12 lower grindstones used as anvils. Based on the large number of broken *S. tabularis* and *Turbo* shells, low numbers of *Turbo* opercula and the stone tools, the BBF 5 site has been designated a shellfish processing or 'extraction' site (for a full discussion *cf.* Ch. 6). BBF 5 is one of the few sites utilised during summer. The shellfish were almost certainly gathered during a low spring tide, brought whole to the site to extract the raw meat which was then probably transported elsewhere, possibly to a site located further inland. As such, the BBF 5 site reflects a brief and opportunistic visit to the coast during summer in order to gather a quantity of protein rich meat intended for consumption at another location.

ca. 3000 B.P.

BBF 7 (Figs. 5.2, 5.17, 5.18. 5.19)

Unlike BBF 1- 5, BBF 7 is a multi-occupation site located in the BBF dunes. The BBF 7 site has two unusual features: firstly, the large number of adzes recovered and secondly the dark, humic matrix surrounding Layers 7\2 - 7\4. Layer 1 rests directly on this humic layer. Analysis of the BBF 7 sediment indicates a high organic component mixed with quartz sand typical of the BBF dunes. A rapid deposition of humic rich palaeosols at around 3000 B.P. can be attributed to the dense forest cover which likely pertained at BBF at this time. With the exception of BBF 4, adzes are virtually absent in BBF assemblages. Adzes were probably used as woodworking tools (Deacon, H.J. 1976; Deacon, J. 1984a: Schweitzer & Wilson 1982) and at BBF 7, adzes account for 40 % of the retouched tools suggesting a high incidence of woodworking activity.

The black mussel, *P. perna*, dominates the shellfish assemblage at BBF 7, and in this respect is similar to the BBF 1 & 2 sites. Although *T. sarmaticus* features strongly in all the BBF 7 layers, *Diloma sp.* and *Patella sp.* and *P. perna* are also common. The mean sizes of the shellfish from BBF 7 are the smallest recorded for all the BBF 7 sites. After 4000 B.P. sea surface temperatures may have decreased by 1 or 2 ^{o}C (Cohen & Tyson 1995) which could have had an effect on shellfish growth rates and size.

It is interesting to note that only the top layer at BBF, Layer 7\1 was occupied during summer. This layer lies directly on top of the humic layers and is surrounded by a white dune sand matrix.

Although the radiocarbon dates for the top and bottom layers at this site are tightly grouped, it suggests that either the ecological conditions rapidly changed at the site prior to the period that Layer 7/1 was deposited, i.e. became less forested or that during the drier summer months dune sand was more mobile and covered the 7/1 layer fairly rapidly. The former explanation seems more likely as there is no evidence of further humic palaeosols being deposited at the site after the 7/1 occupation. This suggests a rapid change in forest conditions may have occurred at BBF at around the time of the last occupation with dense forest being replaced by grassier vegetation and possibly re-activation of the dune field. Layers 7\2, 7\3 & 7\4 were occupied during winter, probably during periods of high rainfall, rapid deposit of humic palaeosols and dense forest cover.

The BBF 7 site, dated at ca. 3100 B.P., is the last occupation recorded at BBF prior to the arrival of the first pastoralists. A similar pattern is recorded at Byneskranskop 1 and, at this stage, it is not known whether this section of the coast was utilised between 3000 - 2000 B.P. Possibly there was a deterioration in climatic conditions during this period leading to increasing aridity and a reduction in vegetation cover after the occupation of Layer 7/1 and as a result the BBF area may have been abandoned.

2. Type 3 sites

The only Type 3 site, BBF 6, is an open midden located on a coastal promontory directly adjacent to the sea.

c. 4000 B.P.

BBF 6 (Figs. 5.2, 5.14, 5.15, 5.16)

BBF 6 is primarily a shell midden covering over 500 sq.m and with a maximum recorded depth of 1.3 m. Within the section excavated 12 discrete depositional episodes were noted. The top layer dates to 3630 B.P. and the bottom to 4070 B.P. Apart from two retouched pieces, cultural artefacts were absent in all the units excavated. Small quantities of fish bone were found in some layers. Charcoal and ash lenses, probably the remains of hearths, occurred in some units suggesting that shellfish were being cooked on site. However, it is highly unlikely that BBF 6 was an occupation site, firstly as the contents are almost exclusively marine shell and secondly as the site is on a rocky headland totally exposed to the south-easterly and north-westerly winds. Shells from five of the layers were tested for seasonality and with the exception of the top layer, 6\1, which was deposited during summer, the other four layers were deposited during winter. It is interesting to note that the top layer, 7/1 at BBF 7 was also occupied during summer. Although there is some time difference in the radiocarbon dates for 7/1 and 6/1, i.e. 3110 B.P. and 3630 B.P, this may have been a period when coastal resources were opportunistically used during summer but the sample size is too small to make any definitive statements about overall seasonality patterns during this time.

Predicted sea levels for the ca. 4000 B.P. period are + 1.5 - 2 m, but seem to have had little, if any, effect on the species of shellfish available in the BBF area. Thirteen species of shellfish were recorded within the 12 layers, *T. sarmaticus* are the most common followed by *Patella sp*., *H. spadicea* and *P. perna.* During the 400 years that the site was intermittently in use the pattern of exploitation appears to have been similar. A range of shellfish were gathered from the surrounding rocky bays and brought to the site for processing. Processing sites are also recorded on the western Cape coast. At Eland's Bay the formation of megamiddens between 3000 - 1700 B.P. has been attributed to short-lived coastal visits during which shellfish were processed for transport elsewhere (Henshilwood *et al* 1994; Jerardino 1998, 2003).

Some 'snacking' may have occurred at the BBF 6 site, but the main purpose of the hearths are probably for cooking and extracting the meat of the shellfish which may then have been transported to an occupation site situated elsewhere. No evidence of sites dating to this period has been found in the BBF area suggesting either we were unable to locate them during the area survey or they are located further inland.

3. Type 2 sites

Type 2 sites post-date 2000 B.P. and are located in shelters in the cliff face directly above the coastline.

Post 2000 B.P.

BBC (Figs. 5.2, 5.20, 5.22, 5.23)

BBC is a multi-occupation cave site situated 50 m from the sea. During excavation 6 stratigraphic LSA layers were recognised. The uppermost layer, BBC L1, is dated at 290 B.P. or 1651 A.D. Shortly after the BBC L1 unit was deposited the first European travellers were exploring the trade potential of the southern Cape. Ethnohistoric accounts record many Khoekhoe camps on the Riversdale Plain, an area described as rich in cattle although we are unsure whether the BBF area was being used by Khoekhoe at this time. The last inhabitants at BBC occupied the site only very briefly, perhaps as an overnight stop, and may have been among the last hunter gatherers to leave evidence of their visit in the BBF area.

Radiocarbon dates for Layers BBC L5 & BBC L6, based on charcoal and bone samples, are between 1960 B.P. and 1840 B.P. Layers BBC L2, BBC L3 & BBC L4 are undated. The lower layers, in particular, BBC L4 and BBC L5 consist of dense deposits of shell, bone, stone and hearths and in some sections the deposit is up to 20 cm in depth. Layers BBC L1 - L3 are less compact but made up of similar elements to those in the lower layers.

Two sheep bones, obtained from Layers BBC L5 & BBC L6, were radiocarbon dated to 1960 ± 50 B.P. and 1880 ± 55 B.P. and are the earliest dates, using a direct dating method, for the southernmost Cape area (Henshilwood 1996). The presence of sheep, at this early date, is of particular significance as it indicates contact between herders and hunter gatherers took place during the earliest occupation at the site and coincides with a change in site type and location. All units which post-date 2000 B.P. in the BBF area are located in cliff shelters and the dunefields are no longer occupied. In Chapters 5 & 7 it was proposed that BBC was occupied by hunter gatherers and not herders, due to its size, location and difficult access. Herders were probably grazing their stock on the coastal plain to the north of BBF and it is here that contact is likely to have occurred.

Cooler conditions and a lower incidence of forest taxa are predicted by Martin (1968) and Scholtz (1986) for the southern Cape after 2000 B.P. A reduction in vegetation cover and possible reactivation of the BBF dunefields may have caused the change to shelter sites on the coast and may be unrelated to the coincidental arrival of herders at this time.

However, there is some contrary evidence suggesting that the BBF area may have been forested after 2000 B.P. Charcoal from the BBC LSA layers was identified to species level from anatomical features within cell structures by Dr. Caroline Cartwright. *Euclea racemosa* and *Syderoxylon inerme* account for 29 % of the combined totals for all layers and, in addition, a further 15 species of plants were identified. The range of plant species is what we would expect to find in a coastal dune area and it is possible that the firewood used at BBC was collected from the BBF dunefield which, at this time, was at least partially forested.

Although we are unable to determine the population demographics of the Riversdale Plain at around 2000 B.P, we do know that herders were present in the BBF area. Animosity between the two groups may have arisen due to stock theft and/or the disruption of seasonal utilisation of resources by hunter gatherers (e.g. Parkington 1984, 2001; Smith 1986) and it seems most likely that a switch to the use of coastal shelters at BBF after 2000 B.P., can, in part, be attributed to social tensions between hunter gatherers and herders.

Excellent preservation of bone at BBC has allowed a detailed study to be made of the fauna from this site, although the sample size is small. The results show that in addition to shellfish gathering a wide range of other animals were also utilised for food including small, medium and large bovids, small terrestrial mammals, reptiles, marine mammals, birds and fish.

Diloma sp. is the most common species of shellfish in most of the BBC layers, followed by *T. sarmaticus* and *Patella sp.* Overall, the results of the shellfish analysis from this site indicates a shift towards greater utilisation of shellfish located in the upper sections of the intertidal zone. Two species in particular, *H. spadicea* and *S. tabularis,* found only in the Cochlear and Infratidal zones are relatively common in sites pre-dating 2000 B.P., but virtually absent at BBC.

Cultural artefacts include stone and bone tools, pottery, and shell and bone ornaments. In common with other coastal sites which postdate 2000 B.P. (e.g. Die Kelders, Byneskranskop, Nelson Bay Cave) retouched lithics are rare. Unmodified stone tools in quartz and quartzite predominate and silcrete is rarely used. Pottery was found in the same levels as the dated sheep bone suggesting a more or less simultaneous arrival at the Cape of sheep and pottery, although the sources of sheep and pottery may have been from different areas (*cf.* Ch. 8; Henshilwood 1996).

Shells were selected from each layer at BBC for oxygen isotope analysis. The results show that Layers BBC L1, BBC L3 and BBC L6 were occupied during the mid-winter months and Layers BBC L2, BBC L4 and BBC L5 during spring or autumn. This fairly regular pattern of seasonal occupation suggests that coastal visits by hunter gatherers were still timed to coincide with the colder months, even after the arrival of herders, and that during the summer months optimal use may have been made of resources, particularly geophytes, on the upper coastal plain and in the intermontane regions. In this respect, the effect of herders on hunter gatherer movements seems to be minimal.

The small sizes of the post 2000 B.P. sites indicates that hunter gatherer bands were smaller, perhaps less than 10 – 20 people, compared to the larger bands of between 10 - 40 people who utilised open sites during the earlier period at BBF. The high density of deposits, particularly in Layers BBC L4 and BBC L5, point to longer periods of occupation, perhaps a few weeks, than is the case for open sites. Visits may not have been timed to coincide only with low spring tides and could account for the increase in shellfish species at BBC which habituate the upper intertidal zones.

BBF 9 (Figs. 5.2, 5.29, 5.30, 5.31)

At the time the BBF site was occupied, ca. 480 B.P., cool climatic conditions pertained and this is reflected in reduced mean sea surface temperatures (*cf*. Ch. 2 & 9). Situated in the shelter of an overhang, BBF 9 was a single occupation site probably occupied for a week or two by a small band of hunter gatherers. The main features of the site are a large central hearth surrounded by a shell dump composed mainly of *T. sarmaticus, C. oculus* and *Diloma* sp. Pot-shaped impressions in the central hearth suggest that some of the shellfish may have been boiled, possibly the small *Diloma* winkles. The *Turbo* were gathered at low spring tide but it is possible that *Diloma* and *Patella* were collected during a different phase of the occupation when the tides were not as low.

Other fauna from the site includes small and small-medium bovids, hyraxes and a dolphin. Two *Coronula diadema* barnacles, found only on whales, were recovered at BBF 9 suggesting that dolphin and whale meat were brought to the site, probably scavenged from wash-ups.

Almost 4000 unmodified stone artefacts were found at the site, mainly chips, chunks and flakes; 73 % are in quartz and 26 % in quartzite. Only 3 artefacts show signs of retouch. A chunk of resinous mastic, found at the edge of the main hearth, suggests unretouched quartz flakes may have been mounted in mastic and hafted for use as armatures, or possibly cutting tools. A quantity of pottery sherds came from the central hearth area.

Oxygen isotope analysis showed that the 12 opercula tested from the site reflected a mean sea temperature of 15 ^{o}C indicating that the site was occupied in mid-winter.

10.3: Discussion

The Blombosfontein Project demonstrates that the excavation of a suite of coastal sites, situated in close proximity to one another yet temporally separated, provides a broad range of insights into the way that prehistoric people utilised coastal resources over a 7000 year period. In particular the project has demonstrated the advantages of excavating a relatively large number of units, i.e. in the case of BBF, 28 separate depositional episodes, and how these affect ones interpretation of the range of likely activities and how sites are linked to one another, spatially and temporally. If the project had been restricted to say only three sites, and had not investigated sites situated in a range of locations and of different types the conclusions of the project may have been very different. The significance of the BBF approach to excavating shell middens, namely excavating as large a number as is feasibly possible within close proximity of one another, is that it highlights the problems associated with the excavation of perhaps only a single coastal site. Inevitably, in the latter case ones interpretations would be limited to the data of that site only. The advantages of an expanded data base are demonstrated by the BBF project and hopefully future coastal excavations will concentrate on this type of approach.

The core of the project revolved around the analysis of the cultural and faunal components recovered from the nine sites excavated but the study also took into account a number of related issues including palaeoenvironmental changes, site type, size and location, seasonality and ethnohistoric accounts. Where applicable, comparisons were made with coastal and inland sites excavated elsewhere in the Cape and these are discussed in detail in the relevant chapters.

Two of the major events which occurred during the period that BBF was occupied were firstly the arrival of pastoralists in the southern Cape at around 2000 B.P. and the secondly the settlement of Europeans at the Cape in 1652 A.D. Both events are considered likely to have had considerable impact on the hunter gatherer way of life and are one of the focal points of the BBF study.

As expected, shellfish formed a major component of all the assemblages excavated at BBF and indeed may have been one of the main reasons for coastal visits. Less expected was that the total range of shellfish species exploited over 7000 years remained fairly constant indicating that conditions in the intertidal zones remained conducive to supporting the same range of shellfish species found in the area today. This conclusion can now be extended to include the Middle Stone Age levels dating from c. 70 ka - > 140 ka (Jacobs *et al* 2006) where the same species of shellfish were exploited with a few minor exceptions (Henshilwood *et al* 2001a). Sea levels of + 1 - 2 m pertained from around the Mid-Holocene and are likely to have stabilised at their present level after 2000 B.P. Massive outcrops of Table Mountain sandstone at various elevations form the substrate of the rocky bays and inlets found directly below BBF. As such, an incursion of 1 - 2 m would have altered the morphology of the coastline to some extent but had minimal impact on intertidal conditions suited to the establishment of shellfish colonies. Evidence of wave erosion of calcarenites at the base of the cliffs indicates that during periods of high sea levels much of the presently exposed coastline was inundated during high spring tides.

Although the total range of shellfish exploited at BBF remained constant, there was a distinct shift in emphasis in the ranking of species exploited. During the period between 7000 - 2000 B.P. species found in the lower reaches of the intertidal zone were more heavily exploited, specifically *T. sarmaticus*, *S. tabularis* and *H. spadicea*. One reason for this shift is that the pre-2000 B.P. occupations may have been timed to coincide with spring low tides and were generally of shorter duration than is the case for the later sites.

The five species of shellfish best represented at BBF sites were selected for measurement to determine whether there were changes in their mean sizes. The largest mean sizes of *T. sarmaticus, S. longicosta* and *C. oculus* occur in the earliest sites, BBF 1-4. Contrary to expectations *P. perna* and *H. spadicea* are largest in the later sites BBF 6 & 9 and BBC. The smallest mean sizes for the five species measured come from the BBF 7 site dating to ca. 3000 B.P. Changes in sea temperature, salinity and currents are likely to have had some effects on the size of certain species of shellfish, although in a similar study at Byneskranskop 1, Schweitzer & Wilson (1982) considered the overall effect of ecological change on shellfish size to be minimal. Ethnographic studies have demonstrated that constant human predation on a particular species of shellfish will lead to a reduction in mean size over time (e.g. Bigalke 1973; Spenneman 1986; Lasiak & Dye

1989). However, because of the time gaps between depositional units at BBF we are unable to assess the likely effects of human predation on shellfish size. A combination of ecological conditions and human predation may be responsible for the shellfish size patterns observed, but a more definitive answer can only be given if considerably more sites, of a similar time period, are excavated at BBF.

In addition to shellfish, a wide range of marine and terrestrial resources were exploited by the BBF inhabitants. Poor bone preservation in open sites pre-dating 2000 B.P. precludes us from making inter-site faunal comparisons, but the presence of large bone flakes, tortoise, fish bone and lithics associated with meat and hide production suggests that a wide range of animals were brought to some of these sites. At the two sites which post-date 2000 B.P., BBC & BBF 9, we have well preserved evidence of the range of marine and terrestrial animals exploited. In the former category seals, dolphins, whales and sea birds were utilised. Terrestrial animals include various sizes of bovids ranging from the large *Taurotragus oryx* to the small *Oreatragus oreatragus* although small animals such as the Cape dune mole rat and hyraxes dominate the faunal assemblages. Reptiles include tortoises, which are common, and snakes. The overall impression created by the faunal assemblages at BBC & BBF 9, and the limited evidence from the earlier sites, is that while shellfish may have been a dietary staple, prehistoric exploitation of coastal resources extended well beyond shellfish only (also see Dunbar 1991). The variety of marine and terrestrial animals which could be hunted, trapped or scavenged in the BBF area, and the availability of fresh water at coastal springs, must also have been major factors prompting these coastal visits.

Two sites, BBF 5 & 6, are designated as shellfish processing or 'extraction' sites (*cf*. Mellars 1987) and it is considered unlikely that either site was a residential site. Two species of shellfish, *S. tabularis* and *T. sarmaticus* were targeted for collection and brought to the BBF 5 site for processing. The meat of these shellfish was extracted raw and probably carried to an occupation site elsewhere. The BBF 6 site is a large shell midden utilised between 4070 B.P. and 3630 B.P. and contains 12 discrete depositional units. A range of shellfish was brought to the site for cooking and processing and the extracted meat taken elsewhere. BBF 5 & 6 highlight the diversity associated with the exploitation of coastal resources in the BBF area.

Stone tools dominate the cultural artefacts recovered from BBF sites. Between 7000 - 3000 B.P. microlithic tools which broadly conform to the Wilton tradition (*cf.* Deacon, J. 1984a) occur at most sites. Retouched artefacts are predominantly made on fine-grained silcrete. Silcrete does not occur in the immediate vicinity of BBF and is likely to have been brought to the site from the Riversdale or Albertinia area, c. 30+ km to the north-east, where outcrops are common. The use of raw materials not found locally provides some information on the movements of early populations at

BBF and suggests that the inland areas of the coastal plain may have been utilised, possibly seasonally, during the Mid-Holocene. An unusual feature of the lithic assemblages from BBF 1 & 4 is the high ratio of backed pieces in the formal tool category, in particular backed scrapers. Lithic assemblages dating to this period are distinctly different at sites located to the east of the Gouritz River, including Nelson Bay Cave, in that scrapers dominate the retouched tool categories and backed pieces are rare. Byneskranskop 1 and Brakfontein, located to the west of BBF, both contain high ratios of backed tools. New evidence of the numbers of backed lithic elements from the BBF 1 & 4 sites confirms H.J. Deacon's (1976) observations that assemblages to the west of the Gouritz River fall outside any concept of a specific Wilton unit. It is not clear whether backed pieces, which were probably hafted, were used to perform a different function to unbacked scrapers, nor why they occur almost exclusively in sites situated west of the Gouritz River. The reasons could be cultural or functional or both but, as Inskeep (1987) and Lombard (2005b, 2007a) have pointed out, use-wear, residue and macrofracture analysis may be the best approaches to help resolve this issue.

Interestingly, the retouched stone tools from BBF 7 are dominated by adzes. Dense, humic palaeosols at this site suggest a high incidence of forest taxa at the time of occupation and the presence of adzes may be related to woodworking activities at the site and possibly the exploitation of plant foods during the summer occupation at BBF 7\1, although at around the time that Layer 7\1 was occupied it is possible that forest taxa were on the decrease and the BBF dunefield was in the process of re-activation.

Lithic assemblages which post-date 2000 B.P. are dominated by unretouched artefacts in quartz and quartzite and formal tools are rare. A similar pattern is recorded at Nelson Bay Cave, Byneskranskop 1 and Die Kelders suggesting that lithics broadly conforming to the Wilton Tradition are replaced by assemblages dominated by informal tools at coastal sites.

Other cultural artefacts recovered from BBF sites include bone tools, shell and bone beads and ornaments, and pottery; all are broadly similar to those found at Cape coastal sites. Pottery occurs in the same levels as the dated sheep bone at BBC, suggesting they were both introduced to the southern Cape more or less synchronically (Henshilwood 1996).

The location of the BBF sites follows a specific temporal pattern. All sites, with the exception of BBF 6, which predate 2000 B.P. are situated in the elevated dune area and those post-dating 2000 B.P. are in small shelters in the coastal cliffs. For most of the period between 7000 - 2000 B.P. the dunefields were probably stable and well vegetated and provided suitable conditions for the establishment of camp sites. The size of these open sites suggests that hunter gatherer bands were larger in the pre-2000 B.P. period, perhaps between 10 - 40 people, but the relatively low density of the *in situ* deposit points to coastal visits of short duration. Coastal caves and shelters in the BBF area are too small to accommodate groups of this size and may be one of the reasons why the dune area was occupied. After 2000 B.P. the size of hunter gatherer bands may have been smaller, perhaps extended family units of less than 10 – 20 people. Groups of this size could be comfortably accommodated in the small BBF shelters. The high density and volume of assemblages within a single occupation layer at BBC, particularly in the lower units BBC L4 and BBC L5, suggest that some coastal visits after 2000 B.P. were of longer duration than is the case for open sites.

Two sheep bones recovered from BBC layers L5 & L6 were directly dated by the accelerator radiocarbon method to 1960 ± 50 B.P. and 1880 ± 55 B.P. and provide the earliest direct evidence for herding in the southernmost Cape (Henshilwood 1996). Both because of the small size of the BBC & BBF 9 sites and their relative inaccessibility, it is unlikely they were occupied by herders with stock (*cf*. Ch. 7). Both BBC & BBF 9 are therefore regarded as hunter gatherer sites. The sheep at BBC may have been acquired by theft or barter from local herders. Initially, the numbers of herders in the southern Cape may have been low, although by the 17th C. ethnohistorical accounts record large numbers of Khoekhoe herders with cattle and sheep on the Riversdale Plain. During the early stages of contact between hunter gatherers and herders relationships may have been amicable but both archaeological (e.g. Parkington 1986, 1988; Hall 1986) and ethnohistoric evidence (e.g. Parkington 1984; Smith 1986) suggests that shortly after the arrival of herders there was enmity between the two groups which persisted into the historic period. As a result hunter gatherer seasonal rounds may have been disrupted and some bands forced into marginal areas of the Cape. There is a rapid increase in the numbers of small cave sites occupied by hunter gatherers in the western Cape after 2000 B.P., and Parkington (1984) attributes this to domination of the coastal plains by pastoralists. The presence of herders in the BBF area may therefore have been a contributing factor to the abandonment of the dune area and the use of shelter sites by hunter gatherers.

Marine shells from 21 of the BBF sites/units were tested for seasonality by analysing the oxygen isotopes within the shell carbonates. The results show that an overwhelming number of BBF sites/units, i.e. 86 %, were occupied during autumn or winter or spring. Only 3 units were utilised during summer and 2 of these, BBF 5 & 6/1 are regarded as processing sites. A consistent pattern of exploitation of coastal resources during the colder months is evident for the 7000 years that BBF was intermittently occupied, and this pattern continues after the arrival of herders at 2000 B.P., suggesting a minimal disruption of hunter gather seasonal rounds in this area. Summer visits appear to have been short and possibly opportunistic - perhaps coinciding with the movement of a band along the coastal plain who were within striking distance of the coast. In general though, summer visits seem to be highly irregular but provide a further interesting insight into the diverse ways in which coastal resources were utilised in the BBF area.

The last occupation at BBC coincides more or less with the settlement of the first Europeans at the Cape in 1652. By the end of the 18th C. few Khoekhoe herders were left on the Riversdale Plain - mostly due to a series of smallpox epidemics and the effects of Dutch expansionism. Some Khoekhoe may have reverted to a hunting and gathering existence, for example in the early 1800s visitors to Still Bay noted that indigenous people were still utilising coastal resources and operating stone fish traps in the area. In 1808 a land grant was made to Hendrik van de Graaff by the Earl of Caledon giving him rights to the farm Blomboschfontein, of which Blombosfontein Nature Reserve forms a part. Shortly afterwards extensive sections of coastal forest were burnt to eradicate predators and it is likely that at this time the last 'hunter gatherers' in the BBF area were forced to abandon their way of life, either to be taken into employment on farms or forced to move to other areas.

A range of issues relating to the utilisation of coastal resources by prehistoric people during the Holocene was addressed by the BBF project. The results of the study clearly demonstrate the advantages of excavating a range of sites situated within a limited geographical area but also the limitations imposed by time gaps between occupational units and by the numbers of sites which can be excavated and analysed within a limited time period. Nevertheless, the BBF study, in combination with the results from archaeological excavations from other southern and south-western Cape sites, has contributed substantially to our understanding of the economic and cultural diversity present in coastal shell middens situated on this section of the southern Cape coast. In order to understand more fully the diversity of prehistoric human populations, their movements across the landscape and to test our models of seasonality we need both to excavate more coastal sites situated within a circumscribed locality, but also to look further afield, in particular the Riversdale Plain and the intermontane regions of the Langeberg Mountains to the north of BBF.

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APPENDIX

Report on the 1992 – 1999 Later Stone Age archaeological excavations at Blombos Cave, southern Cape, South Africa.

May, 2005

Report compiled by: C. S. Henshilwood & K. L. van Niekerk

Introduction

The Later Stone Age layers at Blombos Cave ($34^0$25'S, $21^0$13'E), were excavated in 1992, 1997, 1998 and 1999. The 1992 excavations are published in Henshilwood (1995) and elements of this and later LSA excavations are published in Henshilwood et al, 2001a, b, 2004, in press (b & d) and van Niekerk, 2004.

Middle Stone Age (MSA) excavations also commenced in 1992 and continued in 1997, 1998, 1999, 2000, 2002, 2004. Further excavations of MSA layers are planned for the future. A list of publications arising from the MSA excavations is listed below the final discussion. A detailed description of the MSA deposits excavated during 1992 – 2000 is contained in the report by Henshilwood *et al,* 2001a. Later publications deal with selected MSA elements excavated up to and including 2004 and LSA elements excavated up to 1999. Here we report on the excavations of the MSA layers and subsequent analysis of the recovered material for the period 2000-2004.

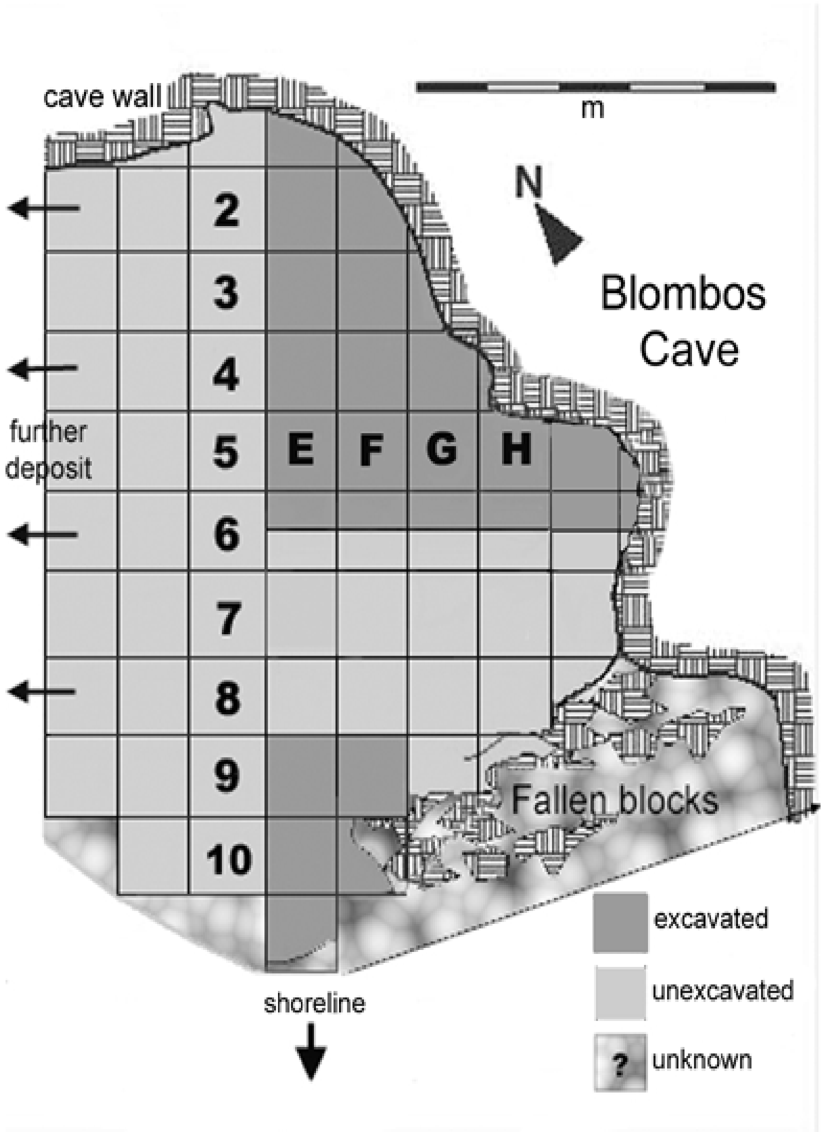

Figure App 1: Layout of Blombos Cave

PART ONE: LATER STONE AGE EXCAVATIONS (1992-1999)

The Later Stone Age (LSA) excavations at Blombos Cave commenced in 1992, with additional excavations in 1997, 1998 and 1999. No LSA material was excavated during 2000 – 2004. The volumes excavated are:

1992 - 166.6 buckets = 1.83 m^3
1997 - 67.41 buckets = 0.74 m^3
1998 - 442.4 buckets = 4.86 m^3
1999 - 137.67 buckets = 1.51 m^3
Total volume LSA excavated = 8.94 m3

Table APP 1:Total volume of excavated LSA material.

Analysis of LSA Material (1992-1999)

All the excavated LSA material from BBC has been sorted into the primary categories of lithics, bone, shellfish, OES, charcoal etc. All finds are packed in labelled plastic bags in acid free boxes and are curated at Iziko-SA Museum.

A sample of the LSA excavated material (20.4%) has been analysed in detail (See Henshilwood, 1995).

All the recovered LSA mammalian fauna (1992-1999) has been analysed by Richard Klein and Kathy Cruz-Uribe (Table APP 5).

All LSA fish bone has been separated from mammalian and other bone. The fish bone from all units in squares E5, F4 and F5 have been analysed in terms of species present per layer (Table APP 6) as well as skeletal element representation per species (Tables APP 7 & 8) (Van Niekerk, 2004).

Layers 1 & 5 have been radiocarbon dated (Tables APP 3 & 4). Layer 1 dates to 290 ±20 BP, and layer 5 dates to 1840 ± 50 b.p. (Henshilwood 1995).

LSA Stratigraphy

The LSA subunits are grouped into 6 main layers. The units that make up Layers 1 - 5 are contained in Table APP 2 (Henshilwood 1995). Layer 6 contains some deposit in unit BSDUN but is primarily regarded as a hiatus layer of aeolian dune sand that separates the LSA from the MSA layers (Henshilwood 1995). It is thought that the deposit in this layer probably derives from the layer above.

Layer 1	BBS	H S	SUR ABS	H2S	COK	CBS	HBS
					HBC/HbCOK BSBCOK		HBSUR

Layer 2		GAL		
		AAL		
	FLIM	LIM	FAL	
	HBFLIM	HBLIM	HBFL	
		PER		
Layer 3	BSACOC	WSACOC	COC '98	HACOC
	CLR	DAS	ABD	HBCOC
Layer 4	SC4	MC1	MCIMC4	MCITUR
	MC123	MC2	PIN	TUR
	HM123	MC3	HIMC3	MC13
		HBMC2		
Layer 5a	HARS	MC4	BMC4	RSMC4
		HBMC4	BSMC4	
Layer 5b		RS1		
		KAR	RSKAR	
		KAR2	RSKAR2	
		HBKAR2		
		RAK1 & RAK2	THRAK	
		RSRAK	HBRAK	
Layer 6	BSDUN	DUN	GSDUN	RS

Table APP 2. LSA stratigraphy at BBC.

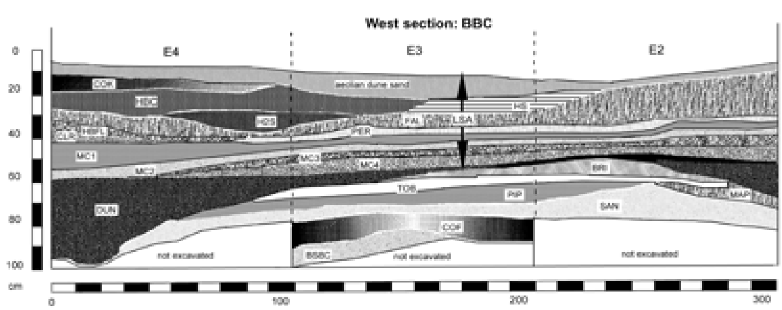

Figure APP 2. West section of LSA stratigraphy squares E4, E3 and E2.

Radiocarbon Dates – LSA

Layer	Unit	Sq.	Ref. No.	Dating Material	^{14}C Age BP	±	1σ	Calibrated Date	1σ	BC/ AD
1	COK	E4	Pta-6184	Charcoal	**290**	2	164	**1651**	165	AD
5	MC4	E4	Pta-6185	Charcoal	**1840**	5	135	**225**	254	AD
5	MC4	E4	Pta-6175	Shell	**2400**	4	27	**74**	115	AD

5	MC4	E4	Pta-6246	Shell	**2280**	5	84	**133**	198	AD
5	MC4	E4	Pta-6247	Shell	**2340**	5	84	**133**	198	AD

Table APP 3. LSA Shell and charcoal radiocarbon dates(1992 excavation)

Layer	Skeletal Part	Reference No.	Uncalibrated radiocarbon determination (B.P.)	Calibrated 1σ date range	δ ^{13}C
5	Left mandible	OxA-4543	1960 ± 50	3 -89 AD	-12.6
6	Calcaneum	OxA-4544	1880 ± 55	82-215 AD	-12.9

Table APP 4. Sheep bone accelerator radiocarbon dates (1992 excavation)

Faunal remains

Mammalian fauna (1992-1999)

The mammalian fauna of all the LSA layers has been analysed by Klein & Cruz-Uribe and are listed in the table below.

Genus & Species		NISPs	MNIs
Erinaceus frontalis	hedgehog	0	0
Lepus capensis	Cape hare	4	1
Lepus saxatilis	scrub hare	33	3
Bathyergus suillus	Cape dune molerat	1189	64
Hystrix africaeaustralis	porcupine	1	1
Papio ursinus	chacma baboon	0	0
Homo sapiens	people	0	0
Canis mesomelas	black-backed jackal	0	0
Canis sp.	dog or jackal	4	1
Ictonyx striatus	striped polecat	0	0
Mellivora capensis	honey badger	21	2
Aonyx capensis	clawless otter	0	0
Genetta sp.	genet	0	0
Herpestes pulverulentus	gray mongoose	1	1
Hyaenidae gen. et sp. indet.	hyena	0	0
Felis libyca	wildcat	6	1
Arctocephalus pusillus	Cape fur seal	288	4
Procavia capensis	rock hyrax	394	12
Elephantidae indet.	indet elephant	1	1
Rhinocerotidae gen. et sp. indet.	rhinoceros	2	1
Hippopotamus amphibius	hippopotamus	11	2
Taurotragus oryx	eland	13	2
Oreotragus oreotragus	klipspringer	2	1
Raphicerus campestris	steenbok	27	8
Raphicerus melanotis	grysbok	23	8
Raphicerus sp(p.)	grysbok/steenbok	178	19
Pelea capreolus	vaalribbok	2	1

Ovis aries	sheep	33	5
Syncerus or Bos	buffalo or cattle	12	1
Syncerus caffer	Cape buffalo	6	1
	Small bovid(s)	1407	22
	Small-medium bovid(s)	239	5
	Large-medium bovid(s)	166	5
	Large bovid(s)	530	6

Table APP 5. MNI and NISP of LSA mammalian fauna

Fish

All LSA fish bone has been separated from mammalian and other bone. The fish bone from all units in squares E5, F4 and F5 (excavated in 1998) have been analysed in terms of species present per layer (Table APP 6) as well as skeletal element representation per species (Tables 7 & 8) (Van Niekerk, 2004).

Note: The category *Sparidae sp 1* includes the species *C. nasutus, C. cristiceps* and *C. laticeps* where these species could not be differentiated from each other. The *Sparidae sp 2* category contains the same above-mentioned species as well as *C. gibbiceps*.

The highest density and widest range of species present at BBC were found in the older levels. Five of the eleven species identified at the site occur in all the levels, and a sixth species occurs in all but one level. As the results are from a sample only, the bigger variety of species in the older levels can probably be attributed to a function of sample size as the quantity of fish in the overlying levels is considerably lower. The most frequently occurring species in the site in terms of numbers is a small shoaling fish (*L. richardsonii*) that was most likely captured in stone fish traps. Almost all the other species present were in all probability caught with some kind of hook and line equipment, although no evidence of such technology has been found.

LEVEL	1	2	3	4	5	6
SPECIES	**MNI/NISP**	**MNI/NISP**	**MNI/NISP**	**MNI/NISP**	**MNI/NISP**	**MNI/NISP**
C. cristiceps (dageraad)	2/3	5/6	1/7	15/108	6/31	29/155
C. laticeps (roman)	1/1	2/3	4/13	13/72	6/27	26/116
C. cristiceps/laticeps	1/1	2/4	7/11	16/60	4/26	30/102
C. nasutus (black musselcracker)	2/3	1/1	3/5	6/24	2/9	14/42
Sparidae sp 1	4/10	4/10	11/43	25/166	9/56	53/285
Sparidae sp 2	2/2	3/3	6/7	25/53	5/15	41/80
D. sargus capensis(dassie)	-	-	-	2/3	2/9	4/12
G. curvidens (john brown)	-	-	-	2/8	1/3	3/11
P. blochii (hottentot)	-	-	-	4/9	3/6	7/15
P. rupestris (red steenbras)	-	-	1/1	-	1/1	2/2
S. durbanensis (white musselcracker)	-	-	-	-	2/3	2/3
S. emarginatum (steentjie)	2/2	2/2	3/7	12/68	5/21	24/100
Sparidae sp	8/39	7/31	16/123	40/812	12/287	83/1308

E. marginatus (rockcod)	1/1	-	2/2	4/16	2/2	9/21
L. richardsonii (haarder)	2/13	4/10	7/55	41/374	10/96	64/548
Shark sp.	-	-	1/2	-	-	1/2
Sp Indet	2/6	1/5	11/24	44/69	18/44	76/148
Total excluding vertebrae	27/79	31/76	73/300	249/1856	88/639	468/2950
No. unidentified vertebrae	87	58	292	1454	435	2326
TOTAL	27/166	31/134	73/592	249/3310	88/1074	468/5276

Table APP 6. Total MNI (Minimum Number of Individuals) and NISP (Number of Identified Skeletal Parts) of fish per species and level found in the L

SPECIES	*C.cristiceps*	*C. laticeps*	*C. cristiceps/ laticeps*	*C. nasutus*	*Sparidae sp 1*	*Sparidae sp 2*	*D.sargus capensis*	*G.curvidens*	*P. blochii*	*P.rupestris*	*S. durbanensis*	*S.emarginatum*	*Sparidae sp*
articular	12.9	17.2	12.7	2.4	1.1	0.0	0.0	9.1	0.0	0.0	0.0	3.0	0.5
basioccipital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
basipterygium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7
basisphenoid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
ceratohyal	0.0	0.0	2.9	0.0	0.0	25.0	8.3	0.0	0.0	0.0	66.7	15.0	0.0
circumorbital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
circumorbital # 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
cleithrum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1
coracoid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
dentary	8.4	6.0	0.0	9.5	9.5	0.0	0.0	0.0	6.7	0.0	0.0	4.0	0.0
epihyal	0.0	0.0	21.6	2.4	0.0	0.0	16.7	0.0	0.0	0.0	0.0	11.0	0.2
epiotic	0.0	0.0	0.0	4.8	6.7	0.0	8.3	9.1	0.0	0.0	0.0	0.0	2.4
ethmoid	0.0	0.0	4.9	2.4	1.4	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.2
exoccipital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3
frontal	0.6	0.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.2
hyomandibular	0.0	0.0	33.3	9.5	0.0	0.0	8.3	0.0	0.0	0.0	0.0	16.0	2.0

hypohyal dorsal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
hypohyal ventral	0.0	0.0	0.0	0.0	1.4	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4
interopercle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
jugal	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
lachrymal	8.4	6.9	0.0	4.8	0.4	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0
maxilla	0.0	0.0	0.0	2.4	19.3	0.0	8.3	0.0	6.7	0.0	0.0	6.0	0.1
mesopterygoid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8
metapterygoid	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
nasal	14.8	23.3	0.0	9.5	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.1
opercle	0.0	0.0	0.0	0.0	11.6	0.0	8.3	0.0	0.0	50.0	0.0	12.0	0.6
otolith	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
palatine	0.0	0.0	0.0	2.4	24.2	0.0	8.3	9.1	0.0	0.0	0.0	0.0	1.2

Table APP 7. % frequency of the MNI of each element per Sparidae species for all squares analysed

SPECIES	*C.cristiceps*	*C. laticeps*	*C. cristiceps/ laticeps*	*C. nasutus*	*Sparidae sp 1*	*Sparidae sp 2*	*D.sargus capensis*	*G.curvidens*	*P. blochii*	*P.rupestris*	*S. durbanensis*	*S.emarginatum*	*Sparidae sp*
parasphenoid	0.0	0.0	15.7	4.8	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4
parietal	0.0	0.0	0.0	0.0	1.1	0.0	0.0	9.1	0.0	0.0	0.0	0.0	2.0
pharyngeal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Postcleithrum Lower	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Postcleithrum Upper	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
posttemporal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2	0.0	0.0	0.0	0.0	4.6
prefrontal	1.9	4.3	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.6
premaxilla	17.4	15.5	0.0	28.6	2.1	0.0	8.3	9.1	0.0	0.0	0.0	7.0	0.0
preopercle	16.8	12.1	0.0	9.5	0.7	0.0	8.3	0.0	0.0	0.0	0.0	1.0	0.1
prootic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	3.0
pterosphenoid	0.0	0.0	0.0	0.0	0.7	0.0	8.3	0.0	0.0	0.0	0.0	2.0	2.4
pterotic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2
pterygoid	0.0	0.0	0.0	0.0	0.0	73.8	0.0	0.0	0.0	0.0	0.0	6.0	0.0
quadrate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	5.2
retroarticular	5.8	6.9	7.8	0.0	0.4	0.0	0.0	0.0	0.0	50.0	0.0	0.0	1.1
scapula	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
sphenotics	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9

subopercle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
suborbital #3	3.2	6.9	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
supracleithrum	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	3.0
supraoccipital	4.5	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	2.2
symplectic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	3.4
Temporal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
urohyal	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.4
urostyle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
vert. penultimate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
vertebrae 1st	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
vertebrae total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
vomer	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	13.3	0.0	0.0	1.0	0.2

Table APP 7 (Continued).

SPECIES	*E.marginatus*	*L.richardsoni*	Sp Indet		**SPECIES**	*E.marginatus*	*L.richardsoni*	Sp Indet
articular	4.8	2.4	1.4		parietal	4.8	0.0	0.0
basioccipital	0.0	6.7	0.7		pharyngeal	0.0	0.0	39.5
basipterygium	4.8	1.4	0.0		postcleithrum lower	0.0	0.0	0.0
basisphenoid	0.0	0.0	0.7		postcleithrum upper	4.8	5.4	0.0
ceratohyal	0.0	4.3	0.0		posttemporal	0.0	0.0	1.4
circumorbital	0.0	0.0	12.9		prefrontal	0.0	0.9	1.4
circumorbital # 2	0.0	0.0	4.1		premaxilla	4.8	0.5	0.7
cleithrum	0.0	8.2	2.7		preopercle	4.8	1.8	2.0
coracoid	0.0	3.4	2.7		prootic	0.0	4.0	0.0
dentary	0.0	2.2	0.7		pterosphenoid	0.0	0.2	1.4
epihyal	4.8	0.7	0.0		pterotic	9.5	3.3	0.0
epiotic	0.0	2.5	3.4		pterygoid	9.5	0.0	0.0
ethmoid	0.0	0.0	0.0		quadrate	0.0	2.7	2.0
exoccipital	0.0	7.8	1.4		retroarticular	0.0	0.0	0.0
frontal	0.0	2.7	0.0		scapula	9.5	3.1	10.9
hyomandibular	0.0	7.6	0.0		sphenotics	0.0	2.2	0.0
hypohyal dorsal	0.0	0.0	1.4		subopercle	0.0	1.1	0.0
hypohyal ventral	0.0	0.0	0.7		suborbital #3	0.0	0.0	2.0
interopercle	0.0	1.4	0.0		supracleithrum	0.0	1.4	0.0
jugal	0.0	0.0	0.0		supraoccipital	0.0	1.3	0.0
lachrymal	0.0	0.0	0.0		symplectic	0.0	0.0	0.0
maxilla	4.8	0.9	0.7		temporal	0.0	0.0	1.4
mesopterygoid	4.8	0.2	0.0		urohyal	4.8	6.0	0.0
metapterygoid	9.5	0.2	0.0		urostyle	0.0	4.5	0.0
nasal	0.0	0.0	0.0		vert. penultimate	0.0	1.3	0.0

opercle	0.0	3.4	3.4		vertebrae 1st	4.8	1.1	0.0
otolith	0.0	0.2	0.0		vertebrae total	0.0	0.0	0.0
palatine	0.0	0.0	0.0		vomer	4.8	0.0	0.7
parasphenoid	4.8	2.9	0.0		Total	100.0	100.0	100.0

Table APP 8. % Frequency of the MNI of each element of L. richardsonii, E. marginatus and Sp. Indeterminate

Shellfish

The shellfish from all squares (Squares E2, E3, E4 and F2) and units of the 1992 excavation has been fully analysed (Tables APP 10 & 11). The 'incidental" (non-food item) species have been analysed by John Pether (Table APP 9). In addition, 1003 *Nassarius kraussianus* shells from all LSA layers have been analysed for evidence of bead making in conjunction with those from the MSA (Henshilwood *et al*. 2004, in press).

Diloma sp. is the most common species of shellfish in most of the layers, followed by *T. sarmaticus* and *Patella sp.* Overall, the results of the shellfish analysis indicates a shift towards greater utilisation of shellfish located in the upper sections of the intertidal zone. Two species in particular, *H. midae* and *S. tabularis,* found only in the Cochlear and Infratidal zones are relatively common in sites pre-dating 2000 B.P., but virtually absent at BBC.

T. sarmaticus opercula were selected from each layer for oxygen isotope analysis. The results show that Layers 1, 3 and 6 were occupied during the mid-winter months and Layers 2, 4 and 5 during spring or autumn. This fairly regular pattern of seasonal occupation suggests that coastal visits by hunter gatherers were still timed to coincide with the colder months, even after the arrival of herders, and that during the summer months optimal use may have been made of resources, particularly geophytes, on the coastal plain and in the intermontane regions.

Species	n		Species	n
Assiminea ovata	1		*Nassarius kraussianus*	388
Austramitra sp.	1		*Nucella cingulata*	2
Austromegabalanus cylindricus	5		*Nucella squamosa*	6
Barbatia obliquata	1		*Ocenebra babingtonii*	3
Burnupena cincta	4		*Ocenebra fenestrata*	6

Calliostoma africanum	1		*Ocenebra purpuroides*	1
Calliostoma sp.	1		*Ocenebra scrobiculata*	8
Chlamys tincta	11		*Octomeris angulosa*	1
Clionella taxea	1		*Ostrea sp.*	2
Crepidula aculeata	1		*Oxystele variegata*	11
Diadora sp.	2		*Reclusia rollandiana*	1
Duplicaria capensis	2		*Siphonaria concinna*	1
Fauxulus capensis	1		*Terebra suspensa*	1
Fissurella mutabilis	7		*Thais castanea*	3
Gibbula sp.	2		*Thecalia concamerata*	2
Helcion pectunculus	7		*Tricolia capensis*	2
Helcion pruinosus	3		*Tropidophora ligata*	2
Homalopoma quantillum	1		*Turbo cidaris*	2
Lasaea adansoni turtoni	1		*Turritella carinifera*	20
Limaria rotundata	1		*Venus verrucosa*	1
Littorina knysnaensis	6021		*Vermetus sp.*	1
Macoma litoralis	1			

Table APP 11: MNI's of 'incidental' shellfish species recovered from LSA layers (1992 excavation)

Species	*Haliotis midae*	*Haliotis spadicea*	*Perna perna*	*Donax serra*	*Dinoplax gigas*	*Chiton crawfordi*	*Scutellastra argenvillei*	*Scutellastra cochlear*	*Scutellastra tabularis*	*Scutellastra barbara*	*Scutellastra longicosta longicosta*	*Cymbula oculus oculus*	*Patella sp.*	*Patella juvenile juveniles*	*Scutellastra granularis*	*Diloma sinensis*	*Turbo sarmaticus*
Layer	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Layer 1	1	3	7	0	0	0	0	8	0	0	0	18	1	52	0	103	22
Layer 2	0	9	42	4	1	5	5	68	0	0	32	58	0	217	2	378	68
Layer 3	0	0	5	0	0	0	2	15	0	0	5	10	1	46	1	35	12
Layer 4	0	65	270	4	0	4	27	419	0	2	191	229	1	917	0	1841	193

Layer 5	0	13	31	0	0	1	2	149	0	0	44	39	0	316	0	605	168
Layer 6	0	0	8	1	0	1	0	34	0	0	8	5	0	182	0	59	17

Table APP 9. MNI of all shellfish species from BBC LSA layers(1992 excavation)

Species	*Haliotis midae*	*Haliotis spadicea*	*Perna perna*	*Donax serra*	*Dinoplax gigas*	*Chiton crawfordi*	*Scutellastra argenvillei*	*Scutellastra cochlear*	*Scutellastra tabularis*	*Scutellastra barbara*	*Scutellastra longicosta*	*Cymbula oculus*	*Patella sp.*	*Patella juvenile juveniles*	*Scutellastra granularis granularis*	*Diloma sinensis*	*Turbo sarmaticus*
Layer	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
Layer 1	20	18	38	0	0	0	12	50	0	0	19	270	27	12	0	517	590
Layer 2	0	51	92	14	0	1	99	516	0	0	467	790	4	40	9	1890	1261
Layer 3	0	0	0	0	0	0	15	129	7	0	57	97	1	16	4	174	158
Layer 4	8	544	2284	16	0	1	571	3298	0	49	2561	2569	36	287	0	9205	5314
Layer 5	0	134	251	0	0	0	33	1160	0	0	664	376	0	99	0	3020	4903
Layer 6	0	3	0	0	0	0	0	287	0	0	106	68	0	47	0	294	282

Table APP 10: Mass (g) of all shellfish species from BBC LSA layers (1992 excavation)

Cultural artefacts

Ostrich Eggshell (OES)

The OES beads from all LSA layers were classified according to degree of completeness and quantified (Table 12). Other OES was examined for modification and weighed. Two pieces showed some sign of possible flask modification and the total weight of the unmodified OES from 1992 – 1999 is 56g.

	Whole	Broken	Fragment	Whole unfinished	Broken unfinished	Fragment unfinished
Layer 1	10	1	2	10	1	2
Layer 2	15	3	3	3	6	2
Layer 3	20	1				21
Layer 4	82	3	4			89
Layer 5	40	1	2			43
Layer 6	4	1				5

Table APP 12. State of completeness of OES beads and from the LSA layers of BBC. (1992 – 1999 excavations)

Bone tools

The majority of the LSA bone tools have been analysed in conjunction with those from the LSA layers of Byneskranskop and Nelson Bay Cave, as well as the BBC MSA bone tools in terms of raw material selection, blank production, shaping techniques, other modifications and use-wear (Tables APP 13 – 19) (Henshilwood *et al.* 2001b).

LSA										
Season	**SAM-AA**	**Tool type**	**Square**	**Dug As**	**Phase**	**Body Part**	**Source**	**Size Class**	**Age**	**Bone type**
1992	8974	"Awl"	E4	MC3	BBC	Tibia	Bovid	I	Adult	cs
1992	8976	"Awl"	E4	GAL	BBC	Shaft	Bird/smal	Unknow	n.a./unknow	c
1992	8977	"Awl"	E4	COK	BBC	Shaft	Bovid	Unknow	Adult	c
1992	8978	"Awl"	E4	AAL	BBC	Rib/vertebra	Bovid	IV	Adult	c
1992	8979	"Awl"	E4	HIS	BBC	Radius	Bird	n.a.	Unknown	cs
1999	8980	"Point	I5	KAR 2	BBC	Shaft	Bovid	II	Adult	c
1998	8981	"Awl"	F3	MC4	BBC	Shaft	Bovid	II	Adult	c

Table APP 13. Detail of the analysed bone tools from the LSA layers (c = cortical; cs = cortical & spongy). (Henshilwood et al, 2001b)

	Length (mm)			Width (mm)			Mean Thickness (mm)		
	Mean	Std	n	Mean	Std	n	Mean	Std	n
LSA	61.4	9.4	6	8.2	4.8	6	2.0	0.7	6
MSA	76.1	31.7	22	10.2	4.4	22	3.0	0.9	22

Table APP 14. Mean length, width and cortical thickness of LSA and MSA bone tools (Henshilwood et al. 2001b).

MSA Class of blank	SAM-AA No.
1. Complete bone that is naturally pointed, e.g. bacullum	8954, 8948
2. Fragments created by breaking and shaping bones	8946, 8966
3. Long bone fragments exploiting natural ridges for shaping	8964, 8939
4. Weathered long bone fragment.	8942
5. Fragments from long bone shafts and mandibles.	8967, 8944, 8953, 8949, 8947, 8955, 8963,
6. Thin, short, points derived from breakage of small shaft	8961, 8940, 8952, 8943, 8956
LSA Class of blank	**SAM-AA No.**
7. Fragments from long bone shafts (bovid & small mammal)	8977, 8980, 8981, 8974
8. Thin, short points (bird bone)	8976, 8979
9. Fragment created by breaking and shaping (vertebra or rib	8978

Table APP 15. Classes of bone tool blanks (Henshilwood et al. 2001b)

	Sample	Right	% Right	Sample	Transverse	% Transverse
BBC						
LSA	7	3	42.9	7	4	57.1
MSA	24	8	33.3	24	7	29.2
Experimental						
Carnivore	622	22	3.5	623	36	5.8
Hammerstone to Carnivore	1,167	46	3.9	1,174	48	4.1
Hammerstone	588	27	4.6	589	30	5.1

Table APP 16. The frequency of right angle and transverse outline breaks on the unworked end of the BBC bone tools compared to experimental samples of broken fresh long bone shafts (Henshilwood et al., 2001b)

MSA Shaping technique	SAM-AA No.
1. Scraping with lithic edge	8939, 8940, 8941, 8942, 8943,
2. Shaping by flake removal	8939, 8948, 8951
3. Abrasion against fixed surface	8945, 8946
4. Shaping and polishing by small particle abrasion (probably	8947, 8955, 8964
5. Shaping by polishing after shaping by scraping	8947
LSA Shaping technique	SAM-AA No.
7. Partial scraping with lithic edge	8980
8. Abrasion against fixed surface	8976, 8977, 8978, 8979, 8980,

Table APP 17. Shaping techniques used to manufacture bone tools in the MSA and LSA (Henshilwood et al. 2001b)

MSA No. of shaped facets	SAM-AA No.
1	8944, 8945
2	8963

3	8941, 8946, 8949, 8952, 8959, 8966, 8967, 8968
4	8939, 8940, 8942, 8943, 8947, 8948, 8951, 8953, 8954, 8955, 8956, 8957, 8958, 8960, 8964, 8965
LSA	
No. of shaped facets	SAM-AA No.
3	8978, 8980,
4	8974, 8976, 8977, 8979, 8981

Table APP 18. Number of shaped facets for MSA and LSA bone tools (Henshilwood et al. 2001b)

Category	MSA	LSA
1. Shaping	Scraping, flake removal, fine abrasion, polishing	Abrasion by grinding against fixed coarse surface
2. Other tool modifications	Oblique engraving, deliberate burning, ochre incorporation in polish	Notches with screw-like morphology, surface ochre deposited post-depositionally
3. Taphonomic differences	Tools medium to dark brown in color, most with heavy patina	Tools light in colour with minimal or no patina

Table APP 19. Principal technological differences between MSA and LSA bone tools (Henshilwood et al. 2001b)

Other bone tools

Two bone tubes, possibly used as beads, with an interior diameter of 5.7 mm and exterior diameter of 9.4 mm, were recovered from Layer 5 dated at 1840 B.P. Similar bone tubes are reported from a number of southern and south-western Cape sites including Oakhurst (Goodwin 1938), Gordon's Bay Midden (van Noten 1974), Die Kelders (Schweitzer 1979) and Byneskranskop 1 (Schweitzer & Wilson 1982). At all these sites bone tubes are only found in units which post-date 3900 B.P.

A single turtle carapace, identified as *Pelomedusa subrufa*, was found intact in Layer 4. Numerous scrape marks on the interior and grinding on the edges suggests it was used as a bowl, possibly to store or mix ochre, as both the edges and inner surface were ochre stained. As this species of turtle is not found in the immediate vicinity of Blombos Cave, it may have been captured in the Duivenhoks or Goukou Rivers and brought to the site.

Marine Shell Artefacts

Two perforated and ground *Conus* shells came from Layer 2 and were probably threaded and used as ornaments. A single ground *Turbo* pendant measuring 36 mm x 14.5 mm was found in Layer 5.

Pottery

Relatively small quantities of pottery sherds came from BBC, although the frequencies increase in Layers 1 and 2 (Table APP 20). Unfortunately most of the pottery sherds were small and therefore not very informative as to the type or shape of vessels from which they originated. A few diagnostic vessel rims without decoration came from the later units but it was not possible to reconcile these with Rudner's (1968:523-524) descriptions of pottery types from this area. The oldest sherds were from the Layer 5 dated at 1840 B.P., and were found in the same layer as the two sheep bones dated at 1880 B.P. and 1960 B.P., suggesting that sheep and pottery were contemporaneous at this time

Layer	Sherds			Finish		Temper	Vessel	Thickness
			Burnishe	Burnished	Unburnished	Quartz		(mean)
	n	g	n	N	n	n	n	mm
1	69	74	68	1	-	61	7	5.0
2	10	38	3	6	2	2	3	6.4
3	1	9	-	-	-	-	-	4.5
4	2	14.5	1	-	-	-	-	5.3
5	2	10	2	-	-	-	-	6

Table APP 20: Inventory of pottery sherds (1992 excavation)

Black burnishing, possibly with soot, is fairly common and only a few sherds have a reddish tinge indicative of ochre burnishing. In the upper layers there are crushed quartz chip inclusions in the sherds, probably to temper the pottery but this method of tempering is not apparent in the lower layers, although rounded quartz grains are present.

Lithics

Lithic artefacts recovered were classified according to the scheme devised by J. Deacon (1984:370-409) which is 'based on the reduction sequence from raw material to formal tool'. All the recovered stone was initially sorted into three classes, namely Unmodified; Modified/Utilised and Retouched (Table APP 21). Each artefact within a class was then classified according to category and raw material (Table APP 22).

Layer	**Unmodified**		**Utilised/ Modified**		**Retouched**		**Site/unit Total**		**AD/g**
	n	**%**	**n**	**%**	**N**	**%**	**n**	**%**	**%**
Layer 1	486	99.2	2	0.4	2	0.4	490	3.4	7.2
Layer 2	1552	99.6	4	0.3	2	0.1	1558	10.8	6.7
Layer 3	1017	100	0	0	0	0	1017	7.1	66.9
Layer 4	552	94.4	29	4.9	4	0.7	585	4.1	0.8
Layer 5	109	94.8	4	3.5	2	1.7	115	0.8	0.8
Layer 6	68	100	0	0	0	0	68	0.5	0.9
Site Total	13718	95.6	166	1.2	472	3.3	14356		

Table APP 21. Inventory of stone artefact classes (1992 excavation)
(AD/g % = density of stone (n) relative to total mass (g) per site) (Henshilwood 1995)

Layer	**Unmodified**	**Utilised/Modified**	**Retouched**

	Q	S	Qt	O	S	Qt	O	Q	S	Qt	O
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Layer 1	8.6	35.7	55.3	0.4	0	100	0	0	0	100	0
Layer 2	15.8	19.1	65.1	0	0	100	0	0	100	0	0
Layer 3	0.3	0	99.7	0	0	0	0	0	0	0	0
Layer 4	47.7	21.9	30.4	0	0	0	0	25	50	25	0
Layer 5	33.6	19.1	46.4	0.9	0	100	0	50	50	0	0
Layer 6	85.8	0	13.2	0	0	100	0	0	0	0	0
Total %	32.0	16.0	51.8	0.2	0	100	0	18.75	50	31.25	0

Table APP 22. Frequencies by layer of raw materials in the major artefact classes (1992 excavation) Raw Materials: Q = quartz, S = silcrete, Qt = quartzite, O = other (c.c.s & limestone) (Henshilwood 1995).

The lithic assemblage of BBC LSA post-dates 2000 B.P. and is dominated by unretouched artefacts in quartz and quartzite and formal tools are rare. A similar pattern is recorded at Nelson Bay Cave, Byneskranskop 1 and Die Kelders suggesting that lithics broadly conforming to the Wilton Tradition are replaced by assemblages dominated by informal tools at coastal sites