THE MOSSEL BAY ARCHAEOLOGY PROJECT (MAP)

BACKGROUND AND RESULTS FROM TEST EXCAVATIONS OF MIDDLE STONE AGE SITES AT PINNACLE POINT, MOSSEL BAY

Final report for the South African Heritage Resources Agency (SAHRA) and the National Research Foundation (NRF)

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Foreword

Dr. Ian Watts was not able to study the ochre before the submission deadline of this report. We can report that ochre is found in large quantities in both Sites 13A and 13B and utilized pieces are common. Along with this report we submit a CD containing this document and its associated figures and tables. A copy of this CD will also be housed at the South African Museum and may be copied with the permission of the project directors and Dr. Graham Avery (Head of the Human Sciences Division of the South African Museum).

Tables and Figures are inserted (without page numbers, excepting tables and figures relating information pertaining to shellfish, faunal and hominid material) at the end of appropriate sections of the report.

INTRODUCTION

In the modern world there is one species of human – modern humans (*Homo sapiens)*. This was not the case as recently as 40,000 years ago. At that time at least two species of humans existed – Neanderthals (*Homo neanderthalensis*) in Eurasia, and modern humans in Africa. However, by 33,000 years ago, Neanderthals were extinct and modern humans were the sole human inhabitants of the earth. The story of the evolution and spread of modern humans is often called "origins of modern humans research", and it is a hot topic in science. It covers a time range dating roughly from 250,000 to 35,000 years ago, a period in Africa that we typically call the Middle Stone Age.

In the last 20 years there has been a burst of progress in the study of the origins of modern humans. Recent advances in genetics have allowed us to study the modern human genome and use genetic variation to examine the history of our species. DNA has even been extracted from Neanderthal fossils for direct comparison to modern humans (they were genetically very different from us). Much of this new research indicates that modern humans evolved first in Africa, and then spread throughout the world, replacing closely related species like the Neanderthals.

When did modern humans evolve? Where in Africa did this evolution take place? What critical changes in intellect and behaviour occurred during this transition that allowed modern humans to eventually dominate the world? These are the questions we are asking, and South Africa plays a special part in answering them. Because of favourable geological conditions that often form caves and preserve fossil bone, South Africa has one of the richest Stone Age records anywhere in the world. This makes South Africa a focus for international science. Sites in South Africa that are well known include Klasies River, Blombos, and Die Kelders Cave 1 (see Figure 1). Based on our initial research, we conclude that Mossel Bay, and its rich archaeological resources can make an important contribution to answering some of these questions.

The Mossel Bay Archaeology Project (MAP) is a long-term field study of the Middle Stone Age (MSA) in the Mossel Bay region. Our primary research goals are to test several competing models concerning the behavioral modernity of MSA people in Africa and thus contribute to our knowledge of the origins of modern humans. In particular, we plan to focus on resolving several chronologic and chronometric questions about the South African MSA, raw material exploitation strategies, and faunal exploitation strategies. To that end we plan a longitudinal study that will involve two missions. The first will be to conduct survey (both archaeological and geological for raw material sources) and test excavations of discovered sites, and this mission has already begun. The second will involve intensive excavations at those previously tested sites identified as having high potential for helping us resolve our research problems.

Archaeological research in the Mossel Bay region has not been intense, despite the early initiation of work by George Leith in 1888 (Leith 1898) at the large Cape St. Blaize Cave, located in the town of Mossel Bay (see Fig. 1 and 2). Last excavated by Goodwin in 1932 (Goodwin & Malan 1935), this site yielded a series of selected lithic collections central to the definition of the Mossel Bay Industry (Goodwin 1930; Sampson 1971). Goodwin argued for the presence of an inter-stratified Howieson's Poort (HP) occupation at Cape St. Blaize cave, but this was based on the presence of point-types thought at that time to be characteristic of the HP, while more recent definitions tend to rely on the presence of backed pieces (Thackeray 1989; Volman 1981). MSA research in the Mossel Bay region effectively stopped after these investigations.

In 1997 Kaplan and Nilssen conducted an environmental impact surface survey of the Pinnacle Point area (Fig. 2), a section of coastal cliffs about 4 km west of Mossel Bay (Kaplan 1997). They covered an area of approximately 2 km of the coast at Pinnacle Point and about 1 km inland and discovered 28 archaeological sites (21 MSA), 15 of which are caves/shelters. In March of 1999 Nilssen and Marean revisited Pinnacle Point and Mossel Bay to survey the area and investigate the potential of the sites. Since then Nilssen and Marean have re-visited several times

for mapping and survey, and in July of 2000 we conducted excavations for 21 days with an excavation team of about 10 people and a laboratory team of 3.

Pinnacle Point has not been archaeologically investigated previously, primarily because the coastal cliffs are dangerous to access. We built a 175-step staircase down the cliff face, and now have safe access to a spectacular array of archaeological sites. This past year we established a permanent grid and produced high resolution maps of four caves. We test excavated 3 caves and discovered well-preserved MSA deposits with faunal preservation in 2. We are writing-up the first season of fieldwork, and were granted funding from the National Science Foundation for 2 years of excavation and 1 year of analysis. Our immediate plans include extending our grid to envelop the entire stretch of cliffs so that all the sites are properly known and positioned, and beginning a large intensive excavation at one cave (13B) that has already yielded two hominid fossil specimens and MSA lithic and faunal remains. We expect all the sites to have faunal preservation, because the quartzitic cliffs are capped by a calcrete that buffers the acidic ground-waters, a situation similar to that at Klasies River, but rare elsewhere in Africa.

There is no doubt that this stretch of coastline is one of the richest sources of MSA archaeological remains anywhere in Africa. Caves, rock shelters, and open air MSA sites are abundant and well preserved and this provides the opportunity to develop an integrated picture of landscape use. Calcretes and caliches are abundant in and around the surface sites, flowstones and dripstones are abundant in the caves and some seal MSA deposits, leading to the possibility of uranium-series dating. Some of the caves are well above the stage 5e high sea stand (Hendey & Volman 1986; Richards *et al.* 1994; Van Andel 1989; Van Andel & Tzedakis 1996) and thus may preserve stage 6 MSA material. Stage 6 MSA is rare in South Africa, and stage 6 is a critical time for the origins of the MSA and modern people. Raw materials are diverse and include local quartzites, non-local quartzites, silcretes of various types, and even non-local hornfels. Fossil bone is well preserved in the deposits, and this is expected as the geology of the sites is very similar to that at Klasies River (see below).

GEOLOGICAL BACKGROUND

The coastal cliffs in this area are exposures of the Skurweberg Formation of the Table Mountain Group. This is a coarse-grained, light-gray quartzitic sandstone (TMS) with beds of varying thickness and consolidation (see Fig. 3 and 4). Small patchy exposures of the Robberg Formation of the Uitenhage Group outcrop above the Skurweberg Formation near the Mossel Bay point. The regional dip varies strongly from west to east between 10 to 75 degrees (South African Geological Series 3422AA 1993). We noticed a trend for caves and shelters to be present when the bedding plane was more horizontal (10-40 degrees) and less resistant layers of TMS eroded out, leaving more resistant layers intact above and below forming a cave or rock shelter (see Fig. 3 and 4). The result is the caves/rock shelters occur in clusters that are predictable from the geologically mapped dip.

Calcretes and dunes cap the TMS throughout the area. The calcretes are highly variable in thickness and form. Some are up to a meter thick or more, while others are thin flows of very hard calcite adhering directly to the TMS. In several road cuts we observed calcretes and caliche horizons in the sands, and in several locations we observed MSA artefactual horizons. Some of these were eroding out from beneath the calcretes, and others were cemented into the calcrete. Various calcite formations are present in the caves/rock shelters, particularly at joints and bedding planes. Small stalactites hang from the roofs of the caves, and large flow-stones cover the walls, and in some cases, archaeological deposits in the caves (see discussion of Cave13B). While the caves are mostly dry today, it is clear that water seeps through the joints and bedding planes of the TMS. While TMS is acidic and typically creates a sedimentary environment

hostile to bone preservation, the water entering these caves has been buffered by the calcretes capping the TMS, raising the ph of the sediments and resulting in outstanding bone preservation. This is similar to Klasies River (Singer & Wymer 1982: 2).

EXCAVATION PROCEDURES

We employ a horizontal grid that encompasses all our excavated sites, and will eventually envelope our entire research region. Our horizontal grid began in Cave 13B, and there is a bolt concreted into the cave that acts as our primary datum (Figure 5). The x, y, z coordinates of that bolt are 100, 100, 0. We currently do not know the true coordinates of this point, but we estimate this point to be about 17 meters above sea level. All x-y-z coordinates for all measurements at all sites are taken relative to this bolt, and thus when we determine its true elevation, we can just add the appropriate value to all elevations to attain true asl and latitude and longitude coordinates. Permanent control points have been shot-in throughout this area, allowing any future researcher equipped with an EDM to establish their precise position relative to our grid by employing a standard surveyor's resection.

The grid we employ is oriented to magnetic north and grid coordinates advance positively to the north and east. A square is named by its south-west corner because this is the minimum grid coordinate for all measurements in that square, using the bearings relative to 0. Thus, our bolt is N100E100, meaning it is 100 meters north and 100 meters east of the 0-point on the grid. Thus, a square can have the name N99E87, and the square directly north would have the name N100E87. This means that any measurement taken from the southwest corner is simply added to the name of the square to attain that measurement=s true coordinates on our grid. For example, an artefact that is plotted at x=N100.38 and y=E100.56 means that the point measures 38 cm north by 56 cm east within square N100E100: its raw grid position is 100.38,100.56 and those numbers alone tells us what square and quad that find is in. Quadrants are 50 cm squares within squares and are named by their bearing and can have only 4 possible names: NE, NW, SE, and SW.

All finds that are identifiable or with a maximum linear dimension of 2 cm or more were plotted in x-y-z coordinates by EDM directly to a hand-held computer. Following terminology typical for South Africa, individual features or layers were called "units", and these were drawn to scale and elevations were taken. All recording was done to forms, and all those data are available in database format. We subsequently grouped units into lager stratigraphic aggregates based on sedimentological similarities. These are described below.

DEPOSITIONAL SUMMARIES FOR JULY 2000 EXCAVATIONS

The following is a general description and interpretation of the major depositional events in the excavated sites. Each square is described as a section of sediments, and the sediments are classified into a series of facies that are defined by their major depositional agent. Broadly speaking, both natural and behavioral processes have contributed to the facies, typically with one dominant over the other. When behavioral sedimentary processes are significant, the name includes "MSA", since no LSA material was found.

Site 9

This is a large cave with an undisturbed sand dune deposit covering the entirety of its floor (Figure 6, 7, and 8). The cave is in a heavily metamorphosed layer of TMS that is resistant and

shows few signs of spalling or other activity. Nearer the front of the cave there are some signs that portions of the roof have collapsed, as indicated by large pock marks in the roof and some roof blocks resting in the dune sand near the surface. Smaller caves are present to the west side of the mouth when looking in, and above the mouth as well. They have sandy sediments eroding out of their mouths. These are not accessible without ascending gear. The cave is currently dry, and the few signs of flowstone are concentrated near the mouth. This cave appears to be very ancient, as suggested by the resistant rock into which it is cut.

There is a large debris field of cliff collapse in and outside the mouth of the cave that nearly seals the entrance. One enters the cave by partially crossing this boulder field, ascending a steep hill of cliff collapse, and then descending down the other side into the cave. This collapse must be geologically recent, because the boulders are sharp and unweathered (unlike the typical boulders in this area), and lichens have yet to invade the zone of cliff detachment. Surprisingly, this cliff collapse did not seem to cause any roof collapse in the cave, and the debris from the collapse failed to roll into the cave beyond the immediate area of the mouth.

Despite the rarity of lithic material in and around this cave, we expected it to have a rich deposit of archaeological material, for several reasons. First, the cave presents a very agreeable living space: it is warm, dry, and protected from the elements. Second, the cave is likely to be very old, and thus could harbour even ESA material.

We placed a 1 x 1 m excavation square near the back of the deposit. This appeared to be a likely location where we would miss potential roof-fall, but the obvious negative aspect of this placement was the potential for thick overburden.

N204E225

Our excavations in this cave penetrated nearly 2 meters into the deposit and failed to encounter any dense archaeological deposit. At 2 m, we deemed any further excavation to be hazardous, and thus terminated the digging. However, we did probe the base of the square with a soil auger with a 10 centimeter diameter, saving all the materials from the auger for study. The auger did not encounter any obvious archaeological materials, but did strike rock at roughly 1 m below the base of our excavated square. We believe that this rock is likely to be roof fall, as the auger did not go through any zones of debris as one would expect if we were encountering a cave floor that had been exposed to erosion.

The sedimentary sequence for this site, at least as revealed by our excavations, is thus very simple. Sometime in antiquity, probably during the MSA (as suggested by the few MSA tools that were found), a large sand dune blew into the cave, sealing all other deposits. The stable and dry nature of the cave minimized any further sedimentary processes, and there was little or no diagenetic modification of the profile. There is some evidence for moderate pedogenesis and horizonation near the top of the section (Figure 8). Unit NG is a dark, slightly humic layer that grades into slightly less dark layers NH and NH1. NG appears to be a surface that developed on the sand dune, with moderate organic deposition, with downward leaching of organics, creating an immature and poorly horizonated soil profile. Pedogenesis was terminated by the deposition of a thin sand.

Future Research at Site 9

It is very likely that site 9 harbours an important archaeological record, however reaching that record would require a gargantuan effort with no sure eventual pay-off. This site would require opening a horizontally large area so that one could step the trench down, thus allowing one to reach deeply into the deposit without fear of a collapse.

Another possibility is to probe the deposits with some type of penetrating radar or sonar to attempt to evaluate the nature of the deposit. One might be able to identify the areas of roof fall, or perhaps see when the sands change to something with archaeological material.

Site 13A

This site resembles a very loose sandy dune blown up against a 2-sided corner in the cliff wall (Figure 9), protected by an overhang in the cliff. The entire dune is within the drip zone of the overhang. The back of the dune against the cliff wall reveals a small cave or tunnel that currently is used as a latrine by fishermen and/or other visitors. The surface sands covering the deposit are disturbed by walking.

The cliff wall and overlying ledge are TMS, some of which is poorly metamorphosed and sometimes even friable. To the south of the site a layer of TMS is currently eroding and flaking off the wall to form a lag of eroded material. Adhering to the wall in two places is a brecciated matrix that includes MSA lithics. There is a sample of this material adhering to the wall just near the top of the dune sands, and there is another breccia adhering to the wall several meters above the dune, far out of reach. We sampled the lower breccia for U-series dating.

Just below the dune is a narrow ledge of harder sandy matrix, partially stabilized with vegetation. On the ledge are numerous quartzite MSA lithics including points, blades, and cores. These resemble the tools from 13B. There is some patchy dark sediment eroding from the base of the dune near these artefacts. This may represent eroding humic archaeological sediment. Below the ledge is a steep slope down to a beach boulder field, and the slope is covered in vegetation.

The site overlooks the ocean. It received sun in the morning during July, but for most of the day the deposit was shaded. The deposit was reasonably well protected from wind.

We placed a 1 x 1 m excavation square near the center of the deposit (Figure 10) and Figure 11 illustrates the stratigraphy.

N69E100

White Sands MSA Facies

At the base of our excavations was a dune sand of coarse undecalcified, whitish, poorly sorted sands. Artefacts and fossil bone are abundant in lenses of finds that show little or no lithologic distinctions. A rotting roof block lies in this layer in the south-east part of the square, but this could be easily removed. These sands were dug as units J and K, recognizing a slight change in K to a sand with grayish nodules, very soft, within the sands and increased artefactual content.

This facies includes units K and J.

Brown Humic Sands MSA Facies

The lower white sands grade into a series of inter-bedded brown-humic sand lenses and white-yellow non-humic sand lenses. Excavators struggled to separate these during excavation but were reasonably successful. These seem to represent events of clean sand deposition (the white-yellow) and humic activity on sand (brown sand) deposition. For example, units G, C and B are brown humic lenses, while E and F are white-yellow non-humic lenses. We also recognized very subtle lenses of burning.

This facies includes units I through B

Light-brown Surface Sands Facies

The section is capped by a light brown surface sand of very loose and disturbed material. This unit is mostly sterile, and includes unit A.

Summary of Sedimentary History of Site 13A

Our excavations clearly only scraped the surface of this site. Thus we have only limited knowledge of the depositional history, mostly concentrating on the latest stages of deposition. Thus our statements below about processes and events that predate our excavations are very conjectural.

Site 13A must have had an early and substantial event of MSA occupation that was ultimately brecciated, and then eroded out of the cave, as evidenced by the breccia horizons both low near the dune and several meters above the dune. This brecciated MSA could have been eroded out by a high sea stand (5e) or perhaps by water flowing from the back of the cave or off the cliff wall. The location of the higher brecciated material poses an unlikely depositional situation given the current configuration of the shelter - there would have been a massive and very steep midden of deposit filling the entire sheltered area. Perhaps there was once a more substantial cave or sheltered area that has since disappeared due to cliff collapse, taking most of the brecciated deposit with the collapsing cliff material.

After this period of erosion, the site was re-occupied by MSA people and we believe that this initial stage of occupation was not reached by our excavations, but is evidenced by the eroding quartzite artefacts at the base of the dune. We think it very likely that the dune hides a much deeper, buried cave that extends farther into the cliff wall, and may be partially filled with sediment.

This earlier MSA was then covered by dune formation, during which the shelter continued to be occupied by MSA people. This occupation was much different from that in 13B, and included substantial use of shell, smaller mammals, OES, smaller lithics, and more regular use of fine-grained raw materials. This could possibly be a HP variant, but we did not find any of the diagnostic HP artefacts, not surprising given our limited sample. This occupation is represented by both the White Sands MSA Facies and the Brown Humic Sands MSA facies.

The site was then abandoned for a substantial period of time, with further dune sand formation capping the deposit. There was no LSA occupation.

Future Research at Site 13A

Site 13A clearly represents a very different type of occupation than 13B. Our initial impression is that the time unit sampled at 13A may be later than 13B because the lithics eroding out of the base of the dune at 13A, and thus probably older than our excavated material, resemble the 13B lithics. Site 13A may represent a buried cave with a more recent dune in the mouth with a later MSA stratified within the dune. This MSA may be the HP, which would be consistent with dune formation since most HP assemblages date to isotope stage 4.

Further excavations at 13A would likely produce interesting results. This site would require an areal single-layer excavation since even the small sections tend to dry quickly and become unstable and collapse. However, a section could be developed against the northern wall (this is out of the sun) by using plexi-glass incrementally lowered and tightened against the section. We would need to stretch a tarpaulin across the mouth of the site to cut the sun and lower drying rates. Scaffolding may not work here due to the softness of the sediment.

Goodwin found at Cape St. Blaize Cave a layer he classified as HP, but it lacked the classic crescents. The assemblage at 13A may be similar to that assemblage. Cave 13A provides a compelling research strategy that would focus on the following issues:

1) The abundance of OES is unusual and combined with the different lithics and raw materials could represent either a late, transitional, or HP-like assemblage. This unusual assemblage certainly warrants further study.
2) The faunal assemblage differs from that in 13B and most other MSA sites in that it consists almost entirely of small mammals. An increased sample would be useful to broaden our understanding of MSA faunal exploitation.

Site 13B

This cave (Figure 12) is oriented with its long axis in an East/West direction (Figure 13), with the circular mouth of the cave facing east and overlooking the ocean. From the back of the cave the mouth resembles a ship's porthole looking out to sea. The roof of the cave is about 7 m at the front and narrows as the sediments slope up toward the back. All of the cave has sufficient room to allow a person to stand except for the few meters at the back. The dimensions of the cave are roughly 30 m long by 8 m wide. The floor of the cave at the mouth is 13 m above the high spring tide mark.

Several layers of TMS of varying erosional resistance form the cave walls and ceiling. Much of the ceiling TMS is lightly metamorphosed, friable, and seems to be regularly producing roof-spalling. The walls are more heavily consolidated and resistant to erosion. The friable nature of the roof makes this a very active cave, perhaps even reasonably young in age.

Much of the cave wall is covered by flow-stone (Figure 14). Small stalactites hang from several locations in the roof. On either side of the cave against the cave wall is a lightly consolidated MSA deposit (LC-MSA) that is capped by a flow-stone. The flow-stone emanates from several joints in the TMS. The LC-MSA has a flaky and crumbly character. Sections of the LC-MSA are well exposed and we recognized four distinct strata on the southern wall, but these are not as clear in the northern sections. Well preserved and abundant fossil bone and MSA lithics are visible.

The area within 13B is well protected from the elements. We noticed that the cave tended to be warmer inside than outside, and it is currently dry. Winds rarely blew into the mouth. During the mornings in July the sun would shine on the front 25% of the floor for several hours, and then disappear behind the cliffs.

N97E97 - N97E96

Stream Facies - Base of section

Water-worn boulders line the base of the excavated area. Some are as large as 1x1 m. Spaces between the boulders are filled with very loose silty sediment, and in some cases there are empty holes between the boulders. There are also some empty spaces between the boulders and the base of the sections. The loose sediment between the boulders includes some roof-fall up to 20 x 20 cm that is not water-worn but exhibits a thin coating of clay, sometimes patchily adhering to the roof-fall. We found rolled fossil bone in this loose sediment, and some of it was bird.

This area appears to be an active or recently inactive zone of water movement, but not high energy. This in indicated by fresh roof fall and the undercut sections. This roof fall, and the fossil bone, was likely transported there by ground water. In antiquity, it is likely that there was a very active, high energy stream running through the cave, as indicated by the large water-worn boulders.

This facies includes unit WL7.

Ponding Facies

This portion of the section starts at the base with unit WL7 and continues approximately 1m up to WI. This is a predominantly sterile zone of grayish-brown silty sediment with thin multiple laminae (Figure 15). The few finds from these units were small, polished, pieces of fossil mammal bone. There was very little roof fall in these units. The silty laminated sediment is best interpreted as a low energy water-lain deposit, possibly indicating regular ponding of water in the back of the cave.

This facies includes unit WL6 through WI.

Erosion Gulley Facies

The ponding processes were cut by an erosional event that appears to be a short and localized event of stream downcutting. This is clearly visible in the north and west sections. The gulley is filled with randomly oriented unworn and unpolished roof spall.

This facies includes units WG, WH, WO, and WP.

Roof Spall Facies

This is then capped by a yellowish layer of decomposing roof spall that appears to terminate the sequence of ponding events. This layer is sandy quartzitic debris that resembles the surface sediment covering the back of the cave, but is finer grained. This is represented by unit WE. One burnt lens (WF) occurs within this facies.

Brown Sand MSA Facies

BS-MSA was used previously and is retained here. The roof spall event is capped by an organic-rich, black to dark brown, sandy sediment rich in lithics and fauna (Figure 16). In N97E97 we encountered just a thin and horizontally restricted portion of this facies that projected just 10 cm into the square. It was named WB. The rest had been removed by the tent platform disturbance. In the west section of N97E97 WB appeared thin and homogeneous. To sample WB better, we extended our excavation with two 50 cm quads to the west into N97E96. As we excavated west, WB thickened and increased in complexity (Figure 17). Several discrete lenses became visible, some of which appeared in the west section of the 2 newly excavated quads. These were not recognized during excavation. They do not appear to be hearths, but may be organic-rich dumps of material. This faces appears to extend far into the back of the cave, as it is visible under a small block of roof fall to the west of our excavation.

This facies is represented by units WB and WQ.

Surface Disturbed Facies

Capping this rich MSA facies is a final layer of roof spall. This material is coarse and sandy yellow roof detritus.

This facies includes units WA, WC, WD, WO.

N91E108

MSA Roof Spall Facies

The base of this square is a clast-supported matrix of small (1 cm and smaller) roof spall with fresh edges, that is variably cemented and uncemented. Uncemented zones were excavated and appear as valleys in the floor of the square between the cemented zones. Stratified within this matrix are small, thin, well-preserved hearths with lithics and fauna laying in and beside the hearths (Figure 18). The hearths, as shown in close-up digital photography, have discrete bands of ash, charcoal, and baked (reddish-brown) sediment. We expect these hearths to continue in all directions, as they are clearly visible in section.

This facies includes units EH3-EC.

Surface Disturbed Facies

A very thin surface material of wind-blown dusty sediment and roof spall overlies the MSA Roof Spall Facies, and includes signs of recent burning.

This facies Includes units EB-EA.

N94E109

Lightly Consolidated MSA Facies

This was previously called the LC-MSA, and we retain that name here. The LC-MSA has multiple layers of burning and organic deposition clearly visible in the digital photos (Figure 19). Lenses of burnt material may represent hearths, and they are often associated with burnt fauna and lithics. Ochre is present in this facies. The entire section is partially cemented with calcium carbonate, and gypsum occurs as lenses, nodules, and pipes running into the section.

This facies includes units NER through NEB.

Flowstone Facies

This is a mostly sterile facies of very hard flowstone that has seeped down from fissures in the TMS above. It does include a few lithics and fossil bone, but these are likely in secondary context and were cemented. The flowstone appears to have multiple events of flowstone deposition.

There is a key question concerning this flowstone: did it once connect to the flowstone on the southern wall and thus once cap an LC-MSA deposit that covered the entire cave floor? The flowstone does not thin out considerably to the south as it becomes more distant from its source, as would be expected if the flowstone did not cover the entire MSA below it, but rather covered just the material on the sides of the cave. However, this does not answer the question conclusively.

This facies includes unit NEA.

Summary of Sedimentary History of Site 13B

The initial deposition in the cave is represented by the LC-MSA facies that likely covered the entire floor of the cave. The flowstone capped the LC-MSA, perhaps only cementing the LC-MSA nearest to the cave wall and closer to the mouth.

An erosional event then cut the LC-MSA and washed a significant quantity of the sediment and MSA material out the mouth of the cave. This erosional event could be the stream-bed represented by the large cobble-layer at the base of N97E97 (the Stream Facies), or a high sea stand of great antiquity (isotope stage 5e). This point is unresolved.

The lithics in the lag deposit of cave 13C may be the remnants of this eroded LC-MSA. In favour of this hypothesis is the fact that MSA artefacts are currently eroding out of the cave mouth above the sea-ward end of the lag deposit. Against this hypothesis are several facts. First, much of the lag deposit occurs under cave 13B and to the north, and if these were from 13B then they must have been washed back (west) into 13C and north. However, many of these lithics are fresh and show no signs of water polishing. Second, there is a substantial deposit of material in the back of 13C, and MSA lithics (as well as a hammerstone) are eroding out of this deposit. And third, the erosional event must be very ancient, and this means that the lithics would have been on the surface of the beach for a very long time. While some show water polishing, the majority are fresh.

Following this erosional event the back of the cave was ponded and silty laminated sediments were laid down with no human occupation. The ponding might suggest that the mouth of the cave was blocked or obstructed, otherwise the cave would have drained more cleanly. The ponded sediments were occasionally cut by erosional events.

MSA people then re-occupied the cave and behavioral sedimentation once again became a major contributor to the sedimentary process. The front of the cave was utilized for domestic tasks, as indicated by the hearths in N91E108. Artefact production and mammal-bone processing occurred in this area. This could be tested by the expectation that bone flakes should be found here, as well as small flaking debris. Fishermen and/or other visitors currently make fires near the front of the cave, presumably due to ventilation, warmth, and the nice view.

The back of the cave was used as a midden, as represented by the Brown Sand MSA Facies. This could be tested by finding processed and discarded fauna but few bone flakes. Lithics should

include pieces discarded early in production (debris), and broken and/or exhausted utilized pieces. There should also be overall larger pieces that were removed from high pedestrian activity areas. It is unlikely that people discarded material out the front of the cave where people walked. Bones in these areas would also draw carnivores.

Future Research at Site 13B

Cave 13 B provides at least two avenues of research.

1) If the flowstone date comes back as old as we think, then the LC-MSA could be some of the oldest MSA in coastal South Africa. If so, removing the breccia in a controlled excavation would save the eroding material and provide a sample from this poorly understood time interval. This could also inform us on the early use of ochre.

2) The later MSA at 13B, as represented by the BS-MSA and MSA Roof Spall Facies, provide an excellent study of MSA lithic raw material exploitation, faunal exploitation, and domestic activity. An areal excavation would focus on the following 3 goals:

1. opening up a large area in the back of the cave to generate a large sample of stone artefacts and fauna
2. opening up a large area in the front to examine domestic hearth activity
3. 2 step trenches up the northern and southern sides to provide a stratigraphic link between the front and back of the caves. This would be further supported by bone and lithic refitting between the areas.

ANALYSIS OF SHELLFISH

Introduction

This report presents results of the shellfish analysis undertaken on the assemblages from Caves PP9, PP13A and PP13B at Pinnacle Point. Observations include species identification, MNI counts and percentage frequency of MNI and weight (grams). For the purpose of this analysis, observations were obtained from quantified marine shells plotted during excavations and recovered from the 10 mm sieve. Marine shell was also retained in the 3 mm and 1.5 mm sieves. The analysis of this finer material might provide a more complete picture of the shellfish assemblages from Pinnacle Point Caves, particularly once the sample size of marine shells is increased with further excavations. So far, the amount of marine shell recovered from all sites combined does not exceed 0.6 kg. Compared to marine shell samples analyzed from other MSA sites along the south coast and LSA sites along the West Coast, this amount is extremely small. No conclusive observation can be drawn from the small shell assemblages recovered from each site at this stage. For this reason, no comparisons were attempted between stratigraphic components for each site. The few observations described and discussed in this report are strictly preliminary.

Methodological and taphonomic considerations

Analysis was undertaken on all shell material, including that of terrestrial origin and macro sediments, such as water-worn shells. Quantification (counting and weighing) was only undertaken on shell remains that resulted from collections made by people in the past. Although quantified, fresh-looking shells (e.g. the presence of periostrum on marine shells) were excluded from the final tables as these were likely deposited during visits to the caves by local 20th Century fishermen. Although present in fair quantities and recorded in spreadsheet files, water-worn shells were also

excluded from the final tables. These macro-sediments are evidently not the direct result of shellfish consumption by people in the past. Based on earlier work with LSA shell-bearing deposits along the South African West Coast (Jerardino 1996), it is clear that the presence of water-worn shells in archaeological sites do not reflect the deliberate transport of these to camp sites. Instead, their presence in archaeological sites is likely the result of water-worn shells clinging to the byssus (threads of attachment) of rocky shore mussels (e.g. black, brown and ribbed mussels) which were collected by people and subsequently taken back to sites of processing and consumption.

During the washing and labeling of the shell material it became apparent that land snail shells were less frequently broken than those of marine origin. If people collected land snails while also collecting marine shellfish during the same visits, then both land snail and marine shells would have been discarded and affected in the same way by post-depositional factors. For this reason, it was expected that land snail and marine shells should show a similar degree of breakage. Upon initial visual inspection, this expectation was not confirmed. After quantifying the number of broken land snail and marine shells for each site, it became clear that marine shells are markedly more fragmented than land snails (Table 1). Although the overall Minimum Number of Individuals (MNI) for each site is very small, the percentage of unbroken land snail shells is markedly higher (between 77% and 50%) than that for marine shells (between 20% and 0%). Unless some significant differences in shell density and toughness exist between land snail and marine shells, this difference (if representative of the larger portion of shells at these sites) could reflect different depositional histories.

The sequence of taphonomic events regarding land snail and marine shells was likely as follows. After shellfish were brought back to site and their flesh consumed, shells were discarded and subsequently fragmented as a result of food processing (heating, opening of bivalves and scooping of limpet contents) and trampling. After the site was abandoned, land snails moved into the site as part of their usual foraging rounds and some subsequently died there. Other agents responsible for the introduction of land snails to the site seems unlikely, as one of their usual predators (field mice) are always capable of breaking up their shells (personal observation, Namaqualand 1989-1996). Moreover, during field surveys, whole and empty snail shells are not rare to find among bushes (on bare surfaces and on those of open sites) and away from mice nests. This clearly shows that land snails can die with their shells undamaged after moving across the landscape during their short life spans. Consequently, land snails do not appear to have been collected by people in the past.

For the above reasons, land snails are not included in the final results of the shellfish analysis at this stage. Nevertheless, as additional shell samples become available with further excavations at Pinnacle Point, this conclusion should be revised before proceeding with the analysis of shell remains. Also, the preliminary interpretation of the presence of land snails in Pinnacle Point caves should also be tested with experiments designed to compare possible differences in the strength and toughness of both land snail and marine shells.

Pinnacle Point 9

An extremely small amount of relatively well preserved shells (total MNI = 12; total weight = 27.4 g) were recovered from PP9. This small amount of shell is further dwarfed by the considerable amount of deposit (2 cubic meters) excavated from a test pit in PP9 (Table 2). The extremely low density of marine shells along with the presence of very few cultural remains appears to indicate very few and brief visits to the cave by people. Only three shellfish species are represented in the PP9 sample (Table 2), namely one species of limpet (*Patella oculus*), the brown mussel (*Perna perna*), and the black mussel (*Choromytilus meridionalis*). At least two brown mussels and all four black mussels recovered from PP9 are sub-adults. It is highly unlikely that

people would have collected sub-adult individuals while ignoring larger adult-sized mollusks. In shell middens of clearly human origin along the South African west coast (Jerardino 1997), sub-adults are always outnumbered by adult individuals by at least one, and frequently two orders of magnitude. Consequently, it is likely that agents other than humans incorporated much of the marine shell into PP9 deposits. Only the presence of one limpet can be attributed directly as a result of foraging rounds by people along the nearby shore. The remaining brown mussels are too fragmented for their identification as either adults or sub-adults. In sum, shellfish collection by humans using cave PP9 was almost non-existent.

Pinnacle Point 13A

Compared to PP9, a much larger number of marine shells were recovered from PP13A (Tables 3 & 4). A total of twelve species are present in this assemblage, although not all of these species are present throughout the stratigraphic sequence and at this stage of fieldwork. Sub-adult brown and black mussels are present, although in very small numbers, throughout the stratigraphic sequence. Limpet species collected from PP13A include *P. barbara*, *P. oculus*, *P. granularis* and possibly *P. tabularis*. In a few instances, weight of shell was estimated, as varying quantities of sand was found cemented to a number of shell fragments. A total of 1.5 grams of shell was not possible to identify, and thus named "unidentified". Marine shells from PP13A appear reasonably well preserved, although somewhat brittle and/or chalky at times when handled during analysis (particularly *P. perna*).

P. perna and *Turbo sarmaticus* dominate the PP13A shell assemblage at this stage of field work. According to the list of species (Tables 3 & 4), the large majority of shellfish was collected from the mid- and lower intertidal rocky shores. Among these species, *T. sarmaticus*, Haliotis *spp*, chitons and *Cymatium cutaceum* are found in the lower reaches of the intertidal and below. Large adult brown and black mussels (*P. perna* and *C. meridionalis*) are also found in the low intertidal and subtidal shores (Kilburn & Ripey 1982, personal observation.). However, size observations for black and brown mussel shells are not available due to extensive breakage of shell remains.

The sample size of marine shells so far recovered from PP13A is very small, and thus little can be said at this stage. For instance, BHS facie appears to have a relatively larger number of shells and higher richness of species when compared to the older and younger stratigraphic components. Nevertheless, this higher species richness in BHS could just be the result of larger quantities of deposit excavated from BHS (an artefact of a larger sample size).

Pinnacle Point 13B

Despite excavation efforts in three areas of this cave, a very small amount of marine shell was recovered (nearly 97 grams overall) (Table 5). This mass is three times less than that excavated from only one square in PP13A. An additional amount of marine shell (about 180 grams), however, was obtained from the disturbed material swept from the inner slope of the cave (named 'Disturbance Above Slope') (Table 6). Shell preservation appears to vary from one area of excavation to the next. In square N91E108 (front of the cave), a small amount of burnt shell was found and only in a few instances the shell weight was estimated because of clumps of sand cemented to other shell fragments. In square N94E109 (below flowstone in northern area of cave), burnt and chalky shell is noticeable, and clumps of sand were removed from shell fragments whenever possible before weighing, although this was not always possible. In squares N97E97 and N97E96 (back of cave), shell was relatively well preserved and in only one instance the shell weight was estimated because of sand cemented to shell fragments.

Overall, *P. perna* and *T. sarmaticus* appear in PP13B with highest frequency, with Patella *spp* (*P. argenvillei* and *P. longicosta*) and the sandy-bottom white mussel *Donax serra* in moderate quantities (Table 5). The analysis of the marine shell from 'Disturbance Above Slope' show the same species comprising the large majority of the assemblage, with Patella spp dominating above the other species (Table 6). Very little can be inferred from the available observations due to the small amounts of shell material available at this stage. According to the list of species (Tables 5 & 6), the large majority of shellfish taken back to PP13B was collected from the mid- and lower intertidal rocky shores, with some visits to sandy beaches where *D. serra* was collected.

Haliotis *spp*, chitons and Crepidula *spp* are not present in PP13B (but present in PP13A), and their absence could just be the result of the very small quantities of shell recovered from this site at this stage. *D. serra* and barnacle, however, are only present in PP13B, and are absent from PP13A where the sample size of marine shell is three times larger than that from PP13B. Either this observation reflects contrasting behavioural and environmental data between PP13A and PP13B, or this difference might merely be the result of identifications based on an overall small sample size of material. Further excavations at Pinnacle Point will help clarify this point.

Some questions concerning the shellfish remains from PP13A and PP13B that may be answered after further excavation and analysis

A few species of shellfish are present in one cave and not the other. For instance, C. cutaceum, Haliotis *spp*, chitons and Crepidula *spp* are present in PP13A, but not in PP13B. On the other hand, *D. serra* and barnacle are only present in PP13B, but are absent from PP13A where the sample size of marine shell is three times larger than that from PP13B. Either this observation reflects contrasting behavioural and environmental data between PP13A and PP13B, or this difference is merely the result of identifications based on an overall small sample size of material.

With a larger sample, it may be possible to resolve the following issues:

i) Because C. cutaceum, Haliotis spp and chitons are species found generally in the lower intertidal and below; does this mean that the inhabitants of PP13A targeted low spring tides more often than those visiting PP13B? If this is the case, it is expected to find large *P. perna* (brown mussel) shells represented in PP13A in greater numbers than in PP13B, as larger mussels are found in the lower reaches of the intertidal and below.

ii) Did the inhabitants of PP13B have a more varied shoreline (rocky shore and long sandy beaches) from which to collect shellfish than their PP13A counterparts (different shorelines due to sea level change with different ages for site occupation, or different foraging areas of the same contemporary shoreline?). If this is the case, it is expected to find other shellfish species from sandy bottoms (e.g., Bullia *spp*, Tellina *spp*., *Lutraria lutraria, and Venerupis corrugata*) to be represented in an enlarged sample from PP13B.

Besides recovering a larger sample size of marine shells, dating of both caves and reconstruction of offshore topography from palaeo-shorelines will help to answer these questions.

In the largest sample of shellfish remains recovered from PP13B ('Disturbance Above Slope'), the frequency of limpet species (Patella *spp*) is very high (%MNI=50, %weight=79.4) when compared to that of PP13A (%MNI=2.6-21.1, %weight=1.6-43.4).

With a larger sample, it may be possible to answer the following questions:

i) Can one explain the differences in limpet frequencies between PP13A and PP13B as a result of shellfish collections involving longer trips to the shore from 13A and shorter trips from PP13B for the collection of shellfish? Limpet shells are frequently found (although not always) in much higher frequencies in late-Holocene LSA sites (west coast) close to the shore (0.1-2 km) and in low numbers in LSA sites far (5-12 km) from the shore (Parkington et al. 1988; personal data).

ii) Is it possible that the differences in limpet frequencies between PP13A and PP13B is the result of differences in the shoreline configuration (exposed reefs / protected embayments) within an essentially equal distance to the shoreline from either of the sites? Small changes in sea-level (2-3 m) can alter the shoreline configuration (micro-morphology) quite significantly (Jerardino 1993), whereby flat reefs can be submerged/exposed and new embayments are created/eliminated depending on the underlying contour of the shore bottom and direction of sea level change.
iii) Can these differences in limpet frequencies be the result of people's preferences?

Final comments: it would be difficult to rank shellfish species. What would be maximized? Amount of food per unit effort? Mussels are not necessarily easier to collect than limpets, unless you take chunks of mussel colonies with a long metal bar like people do in the Transkei. Snails of varying sizes (from a *Turbo sarmaticus* to an Oxystele *spp* size) would be relatively easy to collect. Large abalones (Haliotis spp) are not easy to get because of the depth at which these are found today. Many of the easier to collect, but smaller species are found higher up the shore and many of the more difficult species to collect, but larger species are found in the low intertidal and below. Thus, amount of food per unit effort seems to cancel each other out for many of the species collected by LSA people. The same must have been the case for MSA visitors. What about maximizing calorific value and essential fats per unit effort? Shellfish became quite fatty just before spawning, and that might have been the attraction for people at certain times of the year. Finally, red bait accumulates large quantities of iodine and other important minerals, both of which might have attracted people to forage in the lower reaches of the low intertidal. Chileans commonly eat red bait (it is also dried for delayed consumption).

Conclusion and final comments

MSA inhabitants of Pinnacle Point caves collected marine shellfish from nearby rocky reefs and very occasionally also from sandy beaches. Their collecting rounds targeted the mid- and lower reaches of the intertidal from where brown mussels (*P. perna*), arikreukel snails (*T. sarmaticus*), limpets (Patella *spp*), chitons (Polyplacophora) and black mussels (*C. meridionalis*) were collected during low spring tides. Other species were also gathered (e.g., ear shells or Haliotis *spp*), white mussel (*D. serra*) and corrugated white mussel (*Venerupis corrugata*), but in much smaller quantities.

Although present in the caves, terrestrial mollusks (land snails) appear not to have been collected by MSA people. These mollusks are likely to have entered the caves (perhaps attracted by the garbage left behind) after the abandonment of these sites on several occasions during prehistory. The relative frequency of land snail shells differ from site to site, and similarly, the density of marine shells appears also to vary from one site to another. If these observations are supported by a substantially larger sample size of material, these could prove useful in the reconstruction of site usage and settlement patterns during the MSA. Comparison of shell densities and species frequencies from Pinnacle Point caves with those of LSA sites of known distance to the sea might also help to determine the distance from the shoreline to the caves during the MSA occupation of Pinnacle Point. Again, only further excavations at Pinnacle Point caves leading to the generation of a much larger sample size of shellfish remains will help to provide more definitive answers.

Table 1. Percentage frequency of whole (unbroken) land snail and marine shells for each cave assemblage. Total n is total MNI and not total number of countable shells (bivalves and limpets differ in the equivalence of these two numbers).

Site	**type of shell**	**freq. (%)**	**total n**
PP9	land snail	62.3	61
	marine shell	20.0	10
PP13A	land snail	76.9	13
	marine shell	8.9	55
PP13B	land snail	50.0	2
	marine shell	0.0	25

Table 2. MNI count and weight (g) of marine shell remains at PP9 throughout its stratigraphic sequence.

	Units ND-NE		**Units NH-NH1**		**Units NI-NI7**	
Species	MNI	w	MNI	w	MNI	w
Patella oculus	1	5.3	0	0	0	0
Perna perna	0	0	3	8.5	4	7.4
Choromytilus meridionalis	0	0	0	0	4	6.2

Table 3. MNI count and percentage frequency (%MNI) of marine shell remains at PP13A throughout its stratigraphic sequence. LBSS: Light-brown Surface Sands Facies; BHS: Brown Humic Sands MSA Facies; WS: White Sands MSA Facies.

	LBSS		**BHS**		**WS**	
Species	MNI	%	MNI	%	MNI	%
Perna perna	0	0	31	81.6	13	68.4
Choromytilus meridionalis	0	0	1	2.6	0	0
Turbo sarmaticus	1	33.3	3	7.9	0	0
Haliotis spp	0	0	1	2.6	0	0
Patella *spp*	1	33.3	1	2.6	4	21.1
Crepidula sp.	0	0	1	2.6	1	5.3
Chiton	1	33.3	0	0.0	0	0
Turritellidae	0	0	0	0	1	5.3
TOTAL MNI	**3**	100	**38**	100	**19**	100

Table 4. Shell weight (g) and percentage weight of marine shell remains at PP13A throughout its stratigraphic sequence. LBSS: Light-brown Surface Sands Facies; BHS: Brown Humic Sands MSA Facies; WS: White Sands MSA Facies. Percentages are not calculated for LBSS due to the small amounts of shell present in this stratigraphic component.

	LBSS		**BHS**		**WS**	
Species	w	%	w	%	w	%
Perna perna	3.5	19.6	164.7	73.6	48.4	53.7
Choromytilus meridionalis	0	0	3.7	1.6	1.6	1.7
Venerupis corrugata	0	0	0.1	<0.1	0	0
Turbo sarmaticus	10.2	57.0	37.8	16.9	0	0
Haliotis spp	0	0	0.7	0.3	0	0
Burnupena *sp*.	0	0	1.2	0.5	0	0
Cymatium cutaceum	0	0	0.4	0.2	0	0
Patella *spp*	0.4	2.2	3.5	1.6	39.1	43.4
Helcion sp.	0	0	0.2	0.1	0	0
Crepidula sp.	0	0	0.4	0.2	0.3	0.3
Chiton	3.8	21.2	9.5	4.2	0	0
Turritellidae	0	0	0	0	0.8	0.9
Unidentified	0	0	1.5	0.7	0	0
TOTAL WEIGHT (g)	**17.9**	100	**223.7**	100	**90.2**	100

Table 5. MNI count and weight (g) of marine shell remains at PP13B in squares N91E108 and N94E109. SDF: Surface Disturbed Facies; MRS: MSA Roof Spall Facies; LCO: Lightly Consolidated MSA Facies.

	N91E108				**N94E109**		**N97E97-N97E96**					
	SDF		**MRS**		**LCO**		**WA**		**WB**		**PON**	
Species	MNI	w	MNI	w	MNI	w	MNI	w	MNI	w	MNI	w
Perna perna	1	1.0	1	10.2	2	7.6	0	0	1	2.8	0	0
Choromytilus meridionalis	0	0	0	0	1	2.9	0	0	0	0	0	0
Donax serra	2	9.3	2	21.8	0	0	0	0	0	0.3	0	0
Veneridae	0	0	0	0	0	0	0	0	0	0.3	0	0
Bivalve	0	0	0	0	0	0.3	0	0	0	0	0	0
Turbo sarmaticus	0	4.3	0	1.5	1	1.3	0	0	1	6.7	0	0
Patella *spp*	0	0	0	2.3	0	0	1	19.0	0	0	0	0
Nucella squamosa	0	0	0	0	1	4.3	0	0	0	0	0	0
Barnacle	0	0	0	0	0	0	0	0	0	0.7	0	0
Unidentified	0	1.8	0	0	0	0	0	0	0	0	0	0.2
TOTAL (MNI/WEIGHT)	**3**	**16.4**	**3**	**35.8**	**5**	**16.4**	**1**	**19.0**	**2**	**10.8**	**0**	**0.2**

Table 6. MNI count and weight (g) of marine shell remains at PP13B from the disturbed deposits (Disturbance Above Slope).

Species	MNI	%MNI	w	%w
Perna perna	2	14.3	8.9	4.9
Donax serra	1	7.1	7.4	4.2
Turbo sarmaticus	3	21.4	10.2	5.7
Patella *spp*	7	50.0	142.4	79.4
Burnupena sp.	1	7.1	10.1	5.6
Helcion sp.	0	0	0.1	0.1
Unidentified	0	0	<0.1	<0.1
TOTAL (MNI/WEIGHT)	**14**		**179.2**	

ANALYSIS OF STONE ARTEFACTS

Introduction

The MSA of the Mossel Bay region has not been studied in detail since the 1930's (Goodwin 1930, 1935). More recent excavations at other MSA sites along the southern African coastline have produced an array of artefacts testifying to a diverse range of technological behaviour associated with MSA hominids (Henshilwood and Sealy 1997; Singer and Wymer 1982). There is cause for researchers to reevaluate the idea that the MSA lithic record is internally static and consistent throughout the Middle and late Pleistocene (with the exception of the 'intrusive' Howieson's Poort).

The following section provides a description of the MSA lithics found at Pinnacle Point during the 2000 excavation season. An attempt is made here to provide both a typological and technological review of the samples from each stratigraphic aggregate. One goal of the 2000 excavation was to initiate a regional, systematic raw material sampling program for eventual laboratory isotope analysis. This project will produce a better understanding of raw material selection and procurement behaviour and early modern human mobility patterns by MSA hominids. A raw material survey was conducted during the 2000 excavation season and preliminary results are discussed here.

Early Research in the Mossel Bay Region

MSA archaeology was conducted at Cape St. Blaize Cave, Mossel Bay (some 4 kilometers east of Pinnacle Point) as far back as 1888 with excavations by George Leith. Leith excavated and described a sample of quartzite blades and points, though there appears to be little information regarding the stratigraphic context of his sample (Goodwin 1935). There are several published descriptions of collections made from Cape St. Blaize Cave in the early 20th Century, including one by Dr. E. C. N. van Hoepen who formally groups blades and points from the Leith collection into the Mossel Bay Culture (Goodwin 1935).

Goodwin conducted his own analysis of Leith's sample of Cape St. Blaize artefacts stored at the South African Museum and formally classified this material as well as collections from the Gouritz River and Knysna Heads as the Mossel Bay Variation of the MSA. The Mossel Bay Variation is characterized by parallel and convergently flaked points and blades. Retouch is uncommon though the oak-leaf point (denticulated convergent flake-blade) is present, and all collected artefacts have facetted, rounded butts (Goodwin 1928:417, 1929:135-140).

Goodwin was not satisfied with Leith's sample, and in 1932, accompanied by B.D. Malan, he set out to excavate remaining portions of the cave, as well as raised beach deposits believed to be contemporary with the MSA cave deposits. Based on Leith's sample and the collection of artefacts from the Still Bay type-site of Peers Cave, Goodwin believed that the Mossel Bay was a variation of the Stillbay Industry. He argued that both sites had oak-leaf points, and unretouched artefacts were of similar appearance and design. He believed that differences in both frequencies and form of retouched artefacts were due to differential use of raw material between Stillbay and Mossel Bay implements: "The oak-leaf types point to a connection between this industry and the Still Bay, and it is very possible that an almost complete lack of fine-grained material created the Mossel Bay Variation directly from the Still Bay or some very similar industry. The lack of secondary working is largely due in all

probability to the fact that the coarse-grained sandstone used produces a natural, fine, saw-like edge" (Goodwin 1929:139).

Goodwin argued that his own excavations at Cape St. Blaize Cave supported his belief that the Mossel Bay Variation was contemporary with the Still Bay Industry. In his layer C2, Goodwin discovered a number of artefacts that were similar to those defined as characteristic artefacts of the Howieson's Poort type-site (Stapleton and Hewitt 1927, 1928). These included a unifacial point, an incomplete bifacial point, and a concave scraper. Goodwin (1932:138-140) proposed that these artefacts were an intrusive element in the Mossel Bay sequence similar to and contemporaneous with the so-called intrusive Howieson's Poor layer found at Peers Cave (Keith 1931).

Goodwin's association between the Stillbay and Mossel Bay (based on the intrusional Howieson's Poort layer at both sites) was valid and justified at the time but the stratigraphic sequence at Peers Cave remains unsolved (Anthony 1972; Jolly 1947, 1948). In addition, after more recent excavations of other Howieson's Poort localities, it is generally accepted that the criteria used in determining the presence of a Howieson's Poort's artefact horizon are more limited to the presence of backed implements, often corresponding with an increased use of fine grained raw material (Thackeray 1992). A single illustrated hollow scraper (Goodwin 1935:132) looks very similar to those found at Klasies (Singer and Wymer 1982:103) and Montagu Cave (Keller 1973). There are no backed blades noted in publication from Goodwin's excavations. The existence of a Howieson's Poort intrusional Layer at Cape St. Blaize cannot be verified without further excavation of any remaining undisturbed deposits of that cave.

Current exploration and research at Pinnacle Point, in conjunction with ongoing excavations at other sites on the southern Cape coast promises the opportunity to continue to resolve the chronology of the Southern Cape MSA. The Pinnacle Point cave complex is situated geographically between Die Kelders and Blombos Cave to the west, and Nelson Bay Cave and Klasies River to the east. All of these sites contain long, documented sequences containing some combination of typical MSA Industries (Volman's MSA 1, 2, and 3), Still Bay MSA, and Howieson's Poort. The paucity of modern interdisciplinary scientific research on human origins in the Mossel Bay region demonstrates the importance of the lithic sequence from the Pinnacle Point cave complex.

The 2000 MSA Artefact Assemblage from Pinnacle Point

The following analysis includes all lithics greater than 10mm excavated from Pinnacle Point caves 13A and 13B. Random samples (approximately 100 pieces each) of artefacts from the disturbed area near the back of cave 13B (13B Disturbance Sample), and from the lag deposit at the mouth of cave 13C (13C Lag Deposit Sample). No overlying Later Stone Age deposits were encountered and all excavated material is attributed to the MSA. Data from all stratigraphic aggregates are included in tables and graphs, though sample size from some of these artefact horizons is often very small, particularly in the Ponding Facies, and MSA Roof Spall Facies. For a detailed description of the stratigraphic aggregates, the reader should refer to the opening section of this document. Each excavated artefact larger than 10mm (excluding the MSA Disturbed Sample and the 13C Lag Deposit surface collections) was piece plotted using an electronic distance measuring machine (EDM), and given a unique specimen number. This analysis will not include a description of the ochre found during the 2000 excavations.

Raw Material

At all Pinnacle Point sites sampled, the predominant raw material used for debitage production is a fine-grained buttery, red, or dark grey coloured quartzite (Table 7, Figure 20). Quartz, crystalline quartz (grouped with quartz for this analysis), and table mountain sandstone (TMS) are used to a lesser degree, while silcrete, Crypto-crystalline silicates (CCS-includes chert and chalcedony), and hornfels are less commonly used.

At many MSA sites including Klasies River (Singer and Wymer 1982), Nelson Bay Cave (Volman 1981), Die Kelders Cave I (Thackeray 2000), and Montagu Cave (Keller 1973; Volman 1981) there is a visible change in the frequency of fine-grained versus course grained raw material represented in the stratigraphic column. Often a shift towards fine-grained raw material use, and especially silcrete, has been equated with the Howieson's Poort Industry (Thackeray 1992). A number of explanations have been proposed for this phenomenon, including but not limited to, symbolic value of the raw material (Wurz 1998), increased mobility (Ambrose and Lorenz 1990), or the necessity for greater control over core reduction by MSA flintknappers (Brown 1999). These explanations are compelling, but they have not been tested in conjunction with a scientific study of raw material source provenience.

At Pinnacle Point, there is no obvious change in raw material frequency percentages between stratigraphic aggregates. However, the Brown Humic Sands MSA Facies of Cave 13A does appear to have a slightly greater percentage of silcrete when compared with other aggregates, as well as a high diversity of raw materials present (Figure 20, Table 7). An increased sample might produce a more striking pattern.

A regional raw material survey was initiated during the 2000 excavation season in order to investigate local resource procurement patterns. The goal of the intensive survey was to begin to locate and sample possible source locations for major categories of utilized raw materials (especially the fine-grained quartzite and silcretes). A second phase of the survey will involve the chemical fingerprinting of the raw material samples in a geochemical laboratory.

The only raw material found locally on site is a light-grey quartzitic sandstone from the coastal cliffs in which the Pinnacle Point cave complex is located. Interestingly, though this material is found immediately on site, it was not a favoured material for flake production. It appears that the majority of the raw materials used in core reduction at Pinnacle Point were procured and transported from an unknown distance to the caves.

An examination of cortical debitage can give some indication of the primary or secondary depositional nature of the raw material source location. Three types of cortex were noted and recorded during the laboratory analysis of Pinnacle Point lithics in the field. These include cobble cortex, outcrop cortex, and rind cortex. Cobble cortex is smooth, very round, sometimes dimpled, and is often of uniform shade and color. Outcrop cortex is generally more rough, irregular, and varied in shade and color. Rind cortex is the chalky matrix that often surrounds silcrete nodules. Rind cortex is found on silcrete from both primary and secondary contexts. Most of the complete quartzite *and* TMS cortical flakes at Pinnacle Point have cobble cortex (Table 2). Silcrete cortical flakes are of both cobble and rind type. The majority of the CCS, hornfels, and other raw materials have cobble type cortex. This suggests that while some of the raw materials are coming from a primary context, most, including many of the more fine-grained raw materials, are coming from a secondary high-energy context. Source locations for such cobbles would include a storm beach at a river mouth, an active riverbed or streambed, or a geologically uplifted riverbed deposit.

The initial raw material survey encompassed two days and focused on the silcrete rich Grahamstown formation of the Bredasdorp geological group (South African Geological Series 3420 1993; 3422A 1993) at the confluence of the Gourits and Drour Rivers some 12-15 km NE of Pinnacle Point. This location was chosen as being an area that would naturally concentrate silcrete and quartzite cobbles of the Bredasdorp and Table Mountain Groups respectively.

Permission from the landowners, William and Leone Miller, was kindly granted for a foot survey of the river and stream banks. A survey of the Gourits River was conducted by two individuals (Brown and Jenna Cole) and resulted in the collection of three silcrete cobbles of variable quality within a period of about one-hour. The beach also contained quartzite and Quartz cobbles as well as shale and mudstone. A survey of the Drour River (an ephemeral streambed that was dry at the time of our visit) was conducted by a single individual (Brown). The Drour River had a much higher concentration of silcrete and it was possible to locate relatively high quality cobbles and pebbles within a few minutes of searching. The survey encompassed approximately 3-4 linear kilometers and turned up not only silcrete and quartzite cobbles and pebbles, but also some small golf ball-size chert and hornfels pebbles. In general, the higher quality fine-grained materials occurred in smaller nodules.

Primary context silcrete and quartzite deposits are located within 10km of Pinnacle Point. A silcrete outcrop of the Grahamstown Formation located on a ridgetop above the R327 road near Hartebeeskuildam, some 9-10 km from Pinnacle Point was visited. Silcrete here is of moderate to good quality, and several samples were collected. One such sample is virtually identical in terms of matrix and cortex appearance, color, and texture to a small piece of silcrete debitage found in Cave 13B. From the ridgetop, there is a clear view of the gentle sloping hills and coastal plain leading up to the cliffs above the site. High quality quartzite similar to the buttery and dark grey quartzites found in the Pinnacle Point sample are located 4 km to the east at Mossel Bay, outcropping from the lighthouse, through Cape St. Blaize Cave, and extending beneath the surface of the Indian Ocean at 'The Point.'

This limited survey demonstrates that the major categories of raw material used during the MSA for flake production can still be found within 10-15 km of the Pinnacle Point cave complex, in both primary and secondary contexts. It might be possible to locate these materials in a more proximal location to the site during a future, more intensive survey program. One limitation of such an approach is that there could be submerged raw material sources in the vicinity of the caves that would have been available to MSA hominds, though this seems unlikely, as there are no river or stream drainages immediately to the east or west that would have supplied the necessary cobbles. Future surveys will focus on the nearby Gourits, Grootbrak, and Kleinbrak river mouths, and surrounding river terrace deposits as well as outcrops of the Bredasdorp and Table Mountain Groups.

Assemblage Composition and Typology

The total sample of lithics from the 2000 Pinnacle Point excavations consists of approximately 768 pieces (refer to Figure 21, Table 9). The largest excavated samples from Cave 13A come from the Brown Humic Sands Facies, and at Cave 13B from the Brown Sand MSA Facies, MSA Roof Spall Facies, and Lightly Consolidated MSA Facies (Table 9). The vast majority of the lithic artefacts in all aggregates can be classified as debitage. The debitage category, consisting of flakes, flake fragments, and chunks/block shatter compose approximately 95% of the entire sample. The majority of the debitage consists of

Chunks/Block Shatter and Flake Fragments (Table 10).

Whole flakes and blades make up about 35% of the total debitage sample (Table 10). The majority of the complete debitage is composed of flakes followed by quadrilateral blades, points, convergent blades, and sidestruck flakes (Table 11, Figure 22). The aggregate samples of greater than 10 whole flakes show a very consistent pattern of cortex on the dorsal surface (Figure 23, Table 12). Nearly 40% of all whole flakes from these samples have a percentage of cortex on the dorsal surface. Primary flakes (67-100% cortex coverage) are present in all whole flake samples greater than 10 pieces, suggesting that primary reduction occurred to some extent in all of the major stratigraphic aggregates. Platform type follows Thackeray and Kelly (1988:24) with the addition of the simple facetted category to describe flake platforms with one to two facetting scars. Plain platform flakes dominate the sample as might be expected, with a smaller number of flakes and blades with facetted, dihedral, simple facetted, crushed, and cortical platforms (Table 13, Figure 24). The dorsal scar pattern on whole flakes and blades demonstrates that most of the complete debitage is produced with parallel and convergent flaking with a very small percentage of debitage produced using radial flaking and other methods (Table 14, Figure 25). Whole flake descriptive statistics are provided in Table 15.

Retouched tools make up a very small portion of the entire Pinnacle Point sample and the overall percentage of retouched tools is low, at 0.78 % for the entire Pinnacle Point sample with a total of 6 retouched pieces (Table 9). Excluding the Still Bay Point fragment found in the Cave 13C Lag Deposit Sample, the remaining retouched artefacts consist of four notched pieces and one denticulate (Table 16).

A summary list of all debitage and retouched pieces are included in Table 17, as a modified version of Geneste's (1988) techno-typology for Middle Paleolithic stone tool assemblages. The advantage of using such a system is that tools are organized according to production phases and it is a convenient way of characterizing the entire debitage assemblage. Stage 0 is associated with primary core reduction (de-cortification), Stage 1 with secondary core reduction (core preparation), and Stage 2 with flake production (core utilization and rejuvenation). The 'Various' stage includes small debitage and chunks/block shatter that are not specific to the other stages. Stage 3 (secondary flake modification) includes deliberately retouched pieces. It can be seen from Table 17 that most of the debitage from the Pinnacle Point sample falls into Stages 1 and 2 of the techno-typology system.

Cores are rare but are more numerous than retouched pieces (Table 9, Figure 21). There are a total of 20 cores, of which 16 are complete (Table 18). The majority of all cores are produced on quartzite and quartz (Table 19). Core classification follows Volman (1981) (Table 20). Disc cores make up nearly half of the core sample (9), followed by single platform (4), and multiple platform cores (2). Other core types represented include conical, convergent, core-on-flake, and minimal cores. No cores were found in the Cave 13C Lag Deposit Sample. Over half of the cores have some percentage of cortex on their total surface (Table 21). The direction and orientation of negative flake scars on the core surface give some idea of flake production technique. Radial flaking is the predominant core preparation method preserved by surface, followed by unidirectional parallel flaking and multiple direction flaking (Table 22). This is interesting in light of the fact that most of the complete flakes show parallel and convergent flake preparation. It appears that in their final stage of reduction, a large number of cores are flaked radially before they are discarded. Complete core descriptive statistics are provided in Table 23.

There are nine hammerstones, all of which are found in Cave 13B (Table 9, Figure 21). Battered pebbles are included in this category. The hammerstones are all either quartzite or TMS cobbles and pebbles.

Comment

In general, the 2000 Pinnacle Point lithic assemblage is composed predominantly of fragmented debitage, followed by whole flakes, and a small percentage of cores. The high overall portion of cortical pieces represented in all technological categories, as well as an almost complete lack of finished retouched products suggest that the lithics from Pinnacle Point stratigraphic aggregates are representative of early and middle phases of lithic tool production. It is possible, however, that a greater sample size from future excavations may produce more lithic samples consistent with a later stage of reduction and might also provide greater internal variability between the stratigraphic aggregates. The proximity of the Pinnacle Point cave complex to high quality quartzite and silcrete (10-15 km), make this an ideal research area for studying early modern human raw material selection behaviour and mobility patterns by continuing a systematic raw material field sampling and laboratory analysis program in this important region.

It is interesting to note that the Pinnacle Point lithics conform to Goodwin's original description of the Mossel Bay Variant if one keeps in mind that Leith's was a selected sample of the 'best' artefacts from Cape St. Blaize Cave, which was the practice at the time. "All the implements are of one general shape; they may be described thus: Longitudinally trimmed flakes, trimmed by the removal two or at most three convergent flakes " (Goodwin 1929:136). He continues, "The flakes generally form points with a general shape much that of an acute-angled isosceles triangle. A number of parallel-sided rectangular flakes…point to this form being also a desired type. Secondary trimming seems uncommon, but is present in some specimens. Some few oak-leaf types appear. In all instances the butt of the implement or flake is faceted [sic] and gently rounded" (Goodwin 1929:136).

A preponderance of convergent and parallel flaked blades and the presence of few retouched pieces are characteristics common to both the Mossel Bay type-site and the Pinnacle Point sample. Of course these same characteristics describe many of the Southern Cape MSA artefact horizons excluding the Howieson's Poort or Stillbay occupations, mainly Volman's MSA 1, 2, and 3. Recently, with research at Blombos Cave, the discovery of numerous examples of finely made Stillbay points have caused researchers to resurrect Goodwin's Stillbay Industry as a formal designation (Henshilwood and Sealy 1997). Perhaps it may be pertinent to give precedence to the Mossel Bay Variant or Industry as a formal designation to describe artefact horizons dominated by parallel and convergent quartzite flakes and blades with a very low incidence of retouch. A goal of any ongoing project in the Mossel Bay region would stand to reevaluate the status of the Mossel Bay MSA cultural sequence in relationship to the Howieson's Poort, Stillbay MSA, and more typical MSA Industries found at sites along portions of the Southern Cape coastline.

ANALYSIS OF FAUNAL REMAINS

Introduction

The study of animal bones from MSA sites is critical in advancing our understanding and knowledge of subsistence behaviour, ecology and palaeoenvironments during this important epoch in human evolution. As stated above, one of our long-term research goals is to test certain competing models of human behavioural modernity in the MSA. One of these models concerned with the study of animal bones, is that proposed by Klein and Cruz-Uribe (1996), which postulates that MSA people were less effective hunters of larger and dangerous animal prey than their LSA descendents. This, and similar models are directly testable through the study of faunal remains and through continued and detailed analysis of the faunal remains from sites in the MAP research area. In this report, however, we give a basic account of the nature of the faunal remains thus far retrieved from tested sites. At this stage, the small size of the faunal assemblage restricts us from making any meaningful assessments pertaining to subsistence and butchery strategies or to make any meaningful comparisons with assemblages from other sites. Nevertheless, our test excavations enabled us to assess the appropriateness of the faunal assemblages to answer certain research questions.

Bone preservation is excellent in all 3 caves that were tested, because calcium carbonate enriched water seeping through the walls and roof of the caves has caused fossilization. Only a few South African sites dating to the MSA preserve animal bones and the sites of Klasies River and Die Kelders have yielded the largest samples thus far reported. Faunal remains are abundant at two of the tested sites at Pinnacle Point, which makes them important to expand our understanding of hominid subsistence behaviour in the remote past.

Thus far we have examined and analysed all plotted and identifiable bone from the three tested caves and the following account pertains to those finds. Typically, specimens unearthed during excavation with a maximum length greater than 2cm, unless identifiable, were plotted.

Methodology

Excavated materials were washed on site with fresh water and where necessary, specimens were washed again in the laboratory at the South African Museum in Cape Town. Bones coated in adhering matrix were carefully cleaned by soaking for several days in luke-warm water and brushing off adhering matrix with soft nylon-bristled brushes. In cases where adhering matrix was very tough and difficult to remove, bone surfaces were cleaned piecemeal with a mechanical tool commonly used by palaeontologists to prepare fossils. Special care was taken not to damage cortical surfaces. Once clean, all bone fragments were labeled with a unique specimen number using indelible, black India ink. Specimens were identified to taxon and/or species and skeletal element where possible. Each specimen was examined macro- and microscopically for fracture features, weathering, burning and bone surface modification such as marks produced by animal gnawing as well as percussion and cut marks produced by humans. Information from detailed examination was entered into a computer database via a coding system developed over several years by Marean. The presentation of results from detailed analysis, including attributes mentioned above, will take place once the faunal sample is increased through further excavation. Here we present a

general overview of the nature of faunal remains in the tested sites. Minimum Numbers of Individuals (MNIs) are not given as the sample is very small and thus such values are of no real significance.

Site 9

The deposit in this cave consists almost entirely of an approximately 3 meter thick aeolian dune that contains a very ephemeral MSA horizon not visible in section. In fact, only a few MSA flakes and a handful of lithic debitage were recovered from this test pit. Due to the nature of this deposit, the matrix could not be excavated stratigraphically and therefore the fauna is presented for Cave 9 as a whole. The deposit in Cave 9 was excavated in arbitrary spits. A mere 9 bone specimens were plotted and they derive from; unidentified micromammal, Cape gray mongoose, chacma baboon, unidentified bovid and unidentified carnivore (see Table 24). It is interesting that no tortoise bone was recovered. In general, tortoise bones are found in high frequencies in most archaeological deposits. None of these fragments retain any characteristics indicative of humans having been the primary accumulating agents. Interestingly, the majority of identified fragments are from carnivores. The faunal sample from Cave 9 is very small and seems, overwhelmingly, the result of non-human accumulation. It appears unlikely that extensive excavation of deposits in this site will yield sufficient quantities of humanly deposited bone to be of any analytical value.

Site 13A

The archaeological deposit in this site consists of two depositional horizons as described above. Unlike the deposit in Cave 9, that in Site 13A consists of material remains deposited predominantly by humans. Apart from faunal remains, substantial quantities of artefactual stone, shellfish, ochre and ostrich eggshell were recovered. For Site 13A as a whole, 350 plotted, identifiable bone specimens are presented in Table 24. Fragments from only two species were identifiable, namely angulate tortoise and grysbok/steenbok. The assemblage is dominated by unidentified mammal, followed by unidentified bovid and tortoise bone. Carnivore and unidentified micromammal bone is rare and this is in contrast with the relatively large proportion of carnivore bones in the Cave 9 deposit. Damage caused by animal gnawing is rare while humanly induced damage occurs more commonly, indicating that the bone in this site was mostly collected and deposited by humans. Interestingly, fish, snake and bird bone are entirely absent from this and other tested sites in the MAP research area. Unlike most other MSA deposits, remains from small mammals are also entirely absent from Site 13A. This suggests that the human signature in the accumulation of this deposit is dominant, making this site unusual and important in terms of advancing our understanding of subsistence behaviour in the MSA.

White Sands MSA Facies

A total of 119 plotted, identified bone fragments are presented in Table 24 for this Facies. The overall pattern of species representation and relative dominance is as that described for the site as a whole, except that only tortoise bone was identifiable to species.

Brown Humic Sands MSA Facies

A total of 204 plotted, identified bone specimens are presented for this Facies in Table 24. Both grysbok/steenbok and angulate tortoise were identified and the pattern of species representation and relative dominance is as that described for the site as a whole.

Site 13B

Four of the seven identified Facies in Site 13B consist of deposits containing archaeological material such as artefactual stone, faunal remains accumulated by humans, ochre, shellfish and ostrich egg shell. Although the non-archaeological deposits contain some bone, we do not discuss them here and most fragments show signs of water wearing and sediment abrasion, but see Table 24. Overall, bone preservation in cave 13B is excellent and bone fragments are present in high frequencies. A total of 1479 plotted, identified bone fragments are presented in Table 24 for Site 13B as a whole. Though several species are represented, the assemblage is unique among MSA assemblages because bones from large animals dominate it. Faunal remains in other South African MSA deposits are more mixed and include high frequencies of tortoise, microfauna, small and large animals. Understanding the human contribution to such assemblages is complicated, as many agents like raptors as well as small and large carnivores are known to deposit bones in caves and shelters. The situation at Site 13B as at Site 13A, therefore, is unique as the bone remains are almost exclusively the result of human activity and the task of reconstructing human dietary behaviour from the bone remains will be less complex and more detailed.

While a much larger variety of species are represented in 13B as opposed to 13A, small mammals and micromammals are relatively rare compared to larger mammals. Carnivores are represented by very few specimens. A range of African bovids are present, but the largest African bovid, the eland, is represented by more fragments than any other bovid species. Even though the sample is very small, it is very interesting that the assemblage is dominated by fragments of the largest bovid represented. Fish and snake bones are entirely absent from the assemblage. Birds are presented by a bone from the jackass penguin and a fragment of unidentified bird. Of specimens identified to species, tortoise bones are always the most abundant in numbers and are present in all Facies containing archaeological material. This is partly due to the fact that tortoise bones are readily identifiable, even when highly fragmented, whereas, when fragmented, bones from other mammals are more difficult to identify to species or even to skeletal element.

Damage caused by animal gnawing is rare, while humanly induced cut marks are common on numerous bones and hammerstone percussion marks do occur. This observation in itself indicates a predominantly humanly procured faunal assemblage. Burnt bones are present, suggesting that bones were tossed into hearths after consumption and some were possibly burned as a result of roasting meat on the bone.

Lightly Consolidated MSA Facies

A total of 262 plotted, identified bone fragments were unearthed from this Facies representing 4 identifiable species namely ungulate tortoise, grysbok/steenbok, mountain reedbuck and eland. Of the bovids, eland are represented by the most specimens. No bird, fish, snake or carnivore remains were found in this Facies. The vast majority of bones are from larger mammals with micromammals and small mammals only represented by 10 specimens.

Brown Sand MSA Facies

Table 24 presents a total of 417 plotted, identified specimens from this Facies as a whole. Several species were identified in this facies including angulate tortoise, jackass penguin, Cape gray mongoose, hyrax, springbok, Cape fur seal, black wildebeest, vaal rhebuck and eland. Again, of the bovids, eland are represented by the largest number of fragments. Micromammals and small mammals are only represented by 9 specimens and carnivore, fish and snake bones are entirely absent.

MSA Roof Spall Facies

671 plotted, identified specimens were recovered from this Facies and represent the following species; angulate tortoise, unidentified mole, unidentified hare, hyrax, springbok, extinct giant buffalo, vaal rhebuck, steenbok, grysbok/steenbok, mountain reedbuck, eland and unidentified carnivore (Table 24). Raphicerus sp. is represented by the most identifiable specimens among the bovids. This Facies includes the widest variety of bovid species of all Facies in this site as well as the combined specimens from the other tested sites. Only one bird bone is present in this Facies while fish and snake are entirely absent.

Surface Disturbed Facies

A total of 62 plotted, identified bone fragments are presented in Table 24 for this Facies and represent the following identified species; angulate tortoise, black wildebeest, eland and unidentified carnivore. Eland are represented by the largest number of fragments. Bird, fish, snake and small mammals are not represented by plotted or identified specimens.

Conclusion

Our study of the animal remains retrieved from tested sites in the MAP research area indicates that two of the tested sites, 13A and 13B, contain adequate quantities of well preserved bone to answer our research questions relating to faunal exploitation strategies employed by people in the MSA. Further study of the bones from sites 13A and 13B will enable us to provide information about ancient environments, various agents contributing to the bone collections in the caves and the strategies employed by prehistoric people for acquiring and processing animal products for consumption and/or use as raw materials for making tools and clothes.

Table 24. The number of plotted, identifiable specimens of tooth and bone from the recognized facies at the Pinnacle Point sites.

	White Sands MSA Facies	Brown Humic Sands MSA Facies	Cave 13 A Total	Lightly Consolidated MSA Facies	Ponding Facies	Erosion Gulley Facies	Roof Spall Facies	Brown Sand MSA Facies	MSA Roof Spall Facies	Surface Disturbed Facies	Cave 13B Total	Cave 9
Reptile												
Chersina angulata (angulate tortoise)	5	27	32	11	2	0	0	34	32	5	84	0
Bird												
Spheniscus demersus (jackass penguin)	0	0	0	0	0	0	0	1	0	0	1	0
Unidentified Bird	0	0	0	0	0	0	0	1	1	0	2	0
Micromammal												
Chrysochloridae (mole)	0	0	0	0	0	0	0	0	1	0	1	0
Unidentified Micromammal	1	1	2	8	2	1	3	7	7	2	30	1
Small Mammal												
Lepus sp. indet.	0	0	0	0	0	0	0	0	1	0	1	0
Herpestes pulverulentus (cape grey mongoose)	0	0	0	0	0	0	0	1	0	0	1	1
Procavia capensis (hyrax)	0	0	0	0	0	0	0	1	1	0	2	0
Unidentified Small Mammal	0	0	0	2	0	0	0	0	0	0	2	0
Large Mammal												
Antidorcas marsupialis (springbok)	0	0	0	0	0	0	0	1	1	0	2	0
Artocephalus pusillus (Cape fur seal)	0	0	0	0	0	0	0	1	0	0	1	0
Connochaetes gnou (black wildebeest)	0	0	0	0	0	0	0	1	0	1	2	0
Papio ursinus (chacma baboon)	0	0	0	0	0	0	0	0	0	0	0	1
Pelorovis antiquus (giant buffalo)	0	0	0	0	0	0	0	0	1	0	1	0
Pelea capreolus (vaal rhebuck)	0	0	0	0	0	0	0	2	1	0	3	0
Raphicerus campestris (steenbok)	0	0	0	0	0	0	0	0	2	0	2	0
Raphicerus sp. indet. (steenbok/grysbok)	0	1	1	2	0	0	0	0	6	0	8	0
Redunca fulvorufula (mountain reedbuck)	0	0	0	4	0	0	0	0	1	0	5	0
Taurotragus oryx (eland)	0	0	0	5	1	0	0	6	2	5	19	0
Unidentified Bovid	11	28	39	30	2	1	0	65	111	9	218	1
Unidentified Carnivore	1	1	2	0	0	0	0	0	1	1	2	5
Unidentified Primate	0	0	0	0	0	0	1	0	0	0	1	0
Unidentified Mammal	101	173	274	200	15	7	32	296	502	39	1091	0

DESCRIPTION OF HOMINID SPECIMENS

Introduction

Understanding human evolution is dependent on having good human fossils from well-understood contexts. Unfortunately, the sample of human fossil remains from the MSA in South Africa is very small. The entire sample could easily fit in a shoebox. Excitingly, we found two hominid fossils: a cranial fragment (Figure 26) and an incisor. Both were found in deposits that had been disturbed, and thus their scientific value is slightly reduced, further highlighting the need to protect these sites from disturbance. Nevertheless, no LSA materials are present in Site 13B, where the hominid specimens were found, and the hominids were found in association with MSA artefactual remains and it is most likely, then, that the hominid specimens are of MSA age. The two hominid specimens are described below.

Parietal Fragment

DESCRIPTION

Pinnacle Point 4 500.

This is a well-mineralized left parietal fragment measuring *ca*. 65 mm by *ca*. 55 mm. Approximately 45 mm of the specimen's sagittal suture (*sutura sagittalis*) is preserved. The maximum thickness along the sagittal border is 6.5 mm and the minimum thickness is 5.6 mm. The serrations are open and there is no evidence of fusion with the opposite side. Although weathered, the surface of the inner table preserves substantial morphological detail. The groove for the sagittal sulcus is weakly developed in this specimen. A pronounced depression of the arachnoid granulations (pacchionian bodies) occurs parallel to the sagittal border. Faint arterial impressions (*impressiones arteriosae*), representing impressions left by branches of the anterior ramus of the middle meningeal artery, radiate towards the sagittal border. Foramina for emissary veins are visible across both the internal and external surfaces. The surface of the external table has a mottled roughness to it, a sign of extensive weathering. This and the presence of calcite crystals on this surface, suggest that the fragment had lain exposed on the cave floor for quite some time. Manganese staining is present on both the internal and external surfaces.

POSITION OF FRAGMENT IN SKULL

The Klasies River Mouth human skeletal collection indicates that modern parietal bone morphology was present in South African Middle Stone Age (MSA) populations (Singer and Wymer 1982). Thus as a guide, a sample of parietal bones from a South African archaeological population was used to facilitate accurate positioning of the fragment in the skull. The presence of the sagittal suture made positioning relatively easy. The parietal bones in the comparative archaeological sample display distinctive changes in bone thickness, curvature and internal morphology along the sagittal border. Typically, relatively thin bone with minimal curvature, combine with depressions of the arachnoid granulations near the frontal angle, while thicker, relatively curved bone, combine with a pronounced groove for the sagittal sulcus approximately half way between the frontal and occipital angles. *Pinnacle Point 4 500* is a relatively thin fragment with minimal curvature. This, in addition to the weak development of the groove for the sagittal sulcus and the presence of a depression of the arachnoid granulations on the inner surface, suggest that this fragment probably originated close to the frontal angle on the parietal bone from which it derives (see Figure 27).

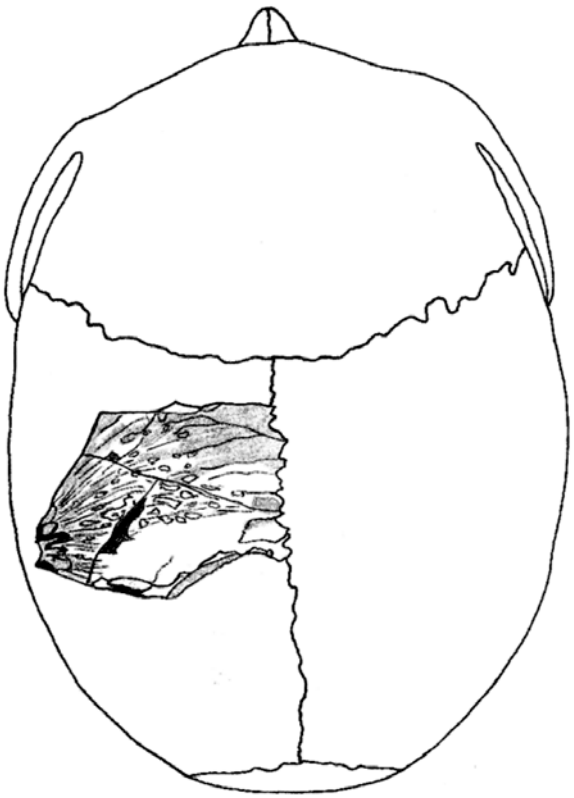

Figure 27. Position of parietal fragment in skull (dorsal view).

AGE OF INDIVIDUAL

The lack of fusion along the sagittal border suggests derivation from either a juvenile or young adult. The thickness of this specimen, however, favours derivation from a young adult rather than a juvenile. The pronounced depression of the arachnoid granulations adds weight to this view, as these depressions are rarely visible in juveniles, are more pronounced in adults and are most pronounced in old individuals (Gray *et al.* 1977).

Central Incisor

DESCRIPTION

Pinnacle Point 4 501.

This is a well-preserved, permanent right central mandibular incisor. The specimen is complete, except for a slightly damaged root apex. The corrected mesiodistal (MD) crown diameter is 5.9 mm and the buccolingual (BL) diameter is 6.2 mm. Corrected crown height is 7.5 mm and root length is *ca*.12.7 mm. Well-defined distal and mesial interproximal wear facets (IWF) are placed slightly lingual to the midline of the tooth. Wear is comparable to wear stage 5 in the Murphy System [as modified by Smith (1984)], and is characterised by a broad strip of dentine exposed along the incisal edge. The crown outline, as seen in the lingual view, is marginally asymmetrical, with wear tapering slightly towards the disto-incisal edge. Weak mesial and distal marginal ridges merge at a slight cervical enamel prominence, creating trace shoveling. Microscopic scratches cover the entire surface of the crown. Vertically orientated scratches are especially evident close to the incisal edge, on the labial face. Enamel polishing is present over the entire surface of the crown. Remnants of

dental calculus are evident on the cervical third of all four faces, but are especially pronounced on the mesial and distal faces. The tooth possesses a fully developed root, which tapers to a closed root apex. It is relatively long and MD compressed.

METRICAL ANALYSIS

Pinnacle Point 4 501 is one of only a handful of measurable permanent central incisors from the South African MSA. Although mandibular central incisors were recovered in similar contexts at Klasies River Mouth and Die Kelders Caves, the teeth from these sites are either unerupted, or are too worn to provide useful metrical data on crown dimensions. *Pinnacle Point 4 501* is thus a very valuable and important addition to a very small sample.

Pinnacle Point 4 501 is a relatively large tooth when compared with modern African populations. However, it is relatively small when compared with fossil specimens from the African Early, Middle and Late Pleistocene (Table 25 and Figure 28). Although worn, *Pinnacle Point 4 501* has the shortest crown height of all fossil specimens, comparing more favourably with modern African specimens. The MD diameter of *Pinnacle Point 4 501* falls at the upper limits of the range of a comparative archaeological and modern African sample. However, compared to the MD diameters of the sample of fossil specimens, *Pinnacle Point 4 501* has the second most compressed crown after the Middle Pleistocene specimen Ternifine (Tighennif) (5.7 mm). The BL diameter of *Pinnacle Point 4 501* also falls at the upper limits of the range of a modern African sample, but is smaller than the mean values of an African archaeological sample. When compared to the BL diameters of the fossil human sample, *Pinnacle Point 4 501* possesses the most BL compressed crown in the sample. Despite this, *Pinnacle Point 4 501* exhibits relative BL expansion, which is one of the trends in human dental evolution during the Lower to Middle Pleistocene. In overall shape [as expressed by a crown shape index (CSI) of 105.1], the crown of *Pinnacle Point 4 501* is morphologically modern. In root length, *Pinnacle Point 4 501* compares more favourably with modern African homologues than with fossil specimens.

Table 25. Mesiodistal (corrected) and buccolingual diameters (in mm), crown shape index (CSI) and root length of Pinnacle Point 4 501 and central mandibular incisors from selected modern, archaeological and fossil humans from Africa.

	n	MD	S.D.	*n*	BL	S.D.	Crown Height	Root Length	CSI	References
Pinnacle Point 4 501		5.9			6.2		*ca.* 7.5	*ca.* 12.7	105.1	Personal data
Border Cave 5					6.6					Stynder et al.(2001)
HDP1-3		6.4			7.2		*ca.* 8.1	15.1	112.5	Stynder *et al.*(2001)
Rabat		6			7				116.7	Bermúdez de Castro (1986)
Ternifine (Tighennif)		5.7			6.6		9		115.8	Bermúdez de Castro (1986)
KNM-WT-15000		6.6			6.8		10.1	19.9	103	Brown & Walker (1993)
KNM-ER-820		6.1			6.3				103.3	Wood (1991)
OH7		6.8			6.6		9.2		97.1	Tobias (1991)
OH16		6.5			7		10.6		107.7	Tobias (1991)
Nubia, "Mesolithic", M	8	5.8	0.35	11	6.43	0.39			110.9	Calcagno (1989)
Nubia, "Mesolithic", F	12	5.48	0.34	14	6.31	0.39			115.1	Calcagno (1989)
San, M	6	5.4	0.47		5.3	0.27			98.1	van Reenen (1982)
San, F	5	5.4	0.84		5.6	0.61			103.7	van Reenen (1982)
San		5			5.2		6.8	12	104	Drennan (1929)
S.A. Blacks, M	181	5.33	0.42		5.83	0.39			109.4	Jacobson (1982)
S.A. Blacks, F	61	5.3	0.35		5.71	0.42			107.7	Jacobson (1982)
S.A.Blacks, M	56	5.43	0.45		6.2	0.32			114.2	Kieser *et al.* (1987)
S.A. Blacks		5.9			6		7.8	12.4	101.7	Shaw (1931)

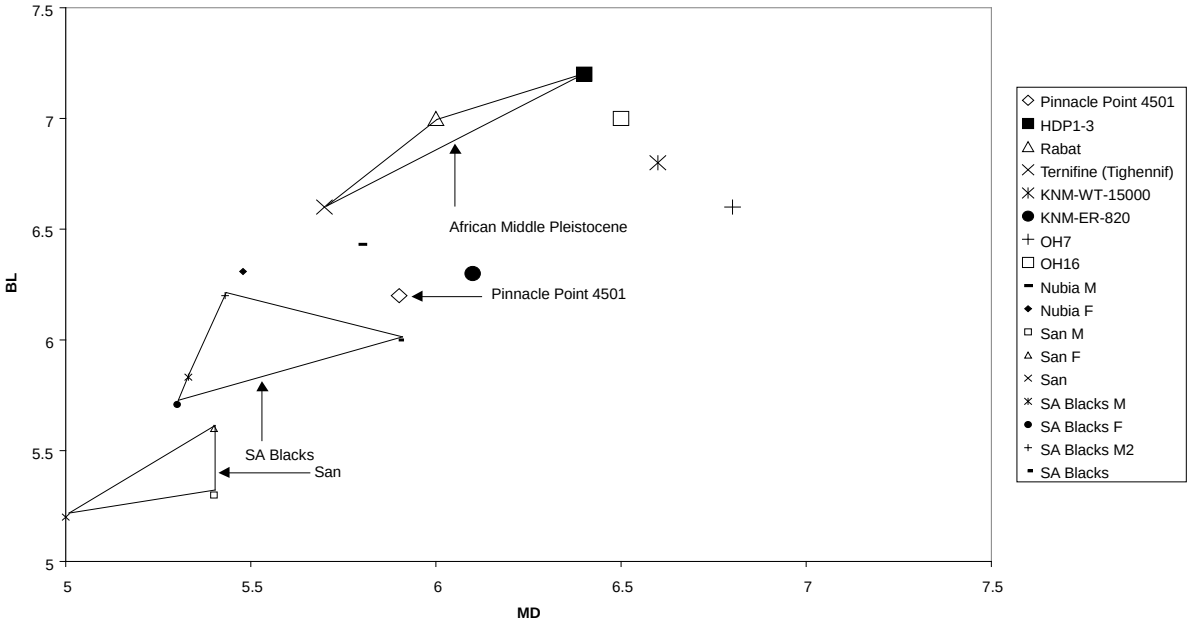

Figure 28. Bivariate plot of MD and BL crown measurements of Pinnacle Point 4 501 compared with those of a homologous modern, archaeological and fossil African sample.

DISCUSSION AND PLANS FOR THE FUTURE

Our excavations were very productive at sites 13A and 13B, but less so at site 9 because a large dune sealed the deposit and we were unable to reach archaeological deposits. We have presented our results, most of which are preliminary, as the excavations and analyses will continue.

The Mossel Bay region is famous in Stone Age studies because it lent its name to one of the first formally recognized stone tool industries in South Africa – The Mossel Bay Industry. This Mossel Bay Industry was defined by John Goodwin in 1928 from a small sample of artefacts excavated by George Leith in 1888 from Cape St. Blaize Cave. The key characteristics of the Mossel Bay Industry are artefacts made on quartzites, and long pointed and parallel-sided flakes. Our excavations revealed similar material, but also some interesting new results. Analysis of the types of stone used for artefact production shows that in ancient times, people traveled fairly long distances (10-15 km) to collect silcrete and high quality quartzite for artefact manufacture. Much of this material was then transported in bulk back to the site and there was manufactured into the final products. This suggests that even at this early time in human evolution, people were carefully planning the way they extracted raw materials and organized their technologies.

MSA inhabitants of caves at Pinnacle Point collected marine shellfish from nearby rocky outcrops and very occasionally also from sandy beaches. Their collecting rounds targeted the mid- and lower reaches of the intertidal zone from where brown mussels, arikreukel snails, limpets, chitons and black mussels were collected during low spring tides. Other species were also gathered (e.g., ear shells, white mussel and corrugated white mussel, but in much smaller quantities). Comparison of shell densities and species frequencies from

Pinnacle Point caves with those of more recent sites of known distance to the sea might also help us to find out how far the shoreline was situated from the caves during the MSA occupation of Pinnacle Point.

Bone preservation is excellent and initial inspection reveals that the fauna from caves 13A and 13B will provide excellent data for investigating faunal exploitation strategies in the MSA. The most striking aspect thus far, is that the fauna from 13B is very different from that recovered from 13A. The former is comprised almost exclusively of large mammals while the latter is dominated by smaller animals. High frequencies of cut marks and hammerstone percussion marks on long bone fragments and the near absence of carnivore tooth marks on bone surfaces, strongly indicates that humans were responsible for accumulating and depositing the bulk of the faunal remains in cave 13B. The situation at 13A is more complicated as several accumulating agents like raptors and carnivores were likely responsible for depositing bones of smaller animals. Interestingly, there are no snake bones in either caves 13A or 13B. This is very unusual and may have significant implications for interpreting the presence of snakes and other fauna in other MSA sites. Because 13B presents a strong human taphonomic signature, the faunal assemblage may be a good indicator of the species range that hominids were and were not exploiting.

Conservation of natural and cultural resources is an increasingly important feature of private and government agencies across the globe. From a cultural perspective, we believe this issue is particularly important in South Africa because our country boasts one of the longest historical (archaeological) records in the world and because the history of South Africa's indigenous populations is represented partly by the cultural remains in archaeological deposits. Additionally, the origins of all modern humans can arguably be traced to Africa and South Africa has yielded the earliest evidence for anatomically modern humans. While certain natural resources, specifically fauna and flora, are to a large extent renewable, cultural resources are not. Once damaged or removed from their original location, the context of cultural resources are lost forever and can no longer be used to learn about people's behaviour in the past and to construct histories of people living in South Africa prior to the introduction of written records. It is of paramount importance, therefore, that cultural resources remain undisturbed so that scientists may study them in their original context. Based on the importance of the sites at Pinnacle Point we urge people to avoid these caves until organized and supervised tours are in place. The public's cooperation in this regard is of utmost importance and greatly appreciated.

To educate the Mossel Bay community about archaeology and the conservation of sites, we intend to present talks at schools and community halls, and we have placed a temporary exhibit at the Diaz Museum. Additionally, we aim to train members of Cape Nature Conservation to incorporate archaeology into existing educational programs. Nilssen presented a well attended talk at the Dias Museum (Mossel Bay) during the 2000 season and also gave two live radio interviews (South Cape Stereo). We also published several articles concerning our research and conservation concerns in the Mossel Bay Advertiser. Several foreign researchers, members of Cape Nature Conservation and Mary Leslie of the SAHRA visited the sites in February 2001. We are working closely with the developers of Pinnacle Point to protect and conserve these important sites.

Our preliminary field research provided outstanding results, and we are excited at the prospect of continuing our work. With the agreement and support of SAHRA, the land owners and the Mossel Bay community, we plan the following. We secured funding from the NSF (USA) for 2 years of excavation and 1 year of laboratory analysis. Our initial plan is to excavate for about 2 months each year and dedicate a year to laboratory analysis and specialist analysis as well as dating. Joined to that effort will be a continuing survey of the

surrounding region, with the goal of finding and documenting other potentially valuable sites. This will help us develop a long-range plan for future research and conservation of Mossel Bay's Stone Age record.

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