Middle Stone Age Lithic Study, South Africa:
An Examination of Modern Human Origins

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Abstract

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The Middle Stone Age began around 300,000 years ago and continued to around 35,000 years ago in Africa. During this period anatomically modern humans emerged in Africa. Also during this period increasingly sophisticated technological innovations and the earliest evidence for symbolic thought entered into the archaeological record. All of these events are critical for our understanding of modern human origins. This dissertation focuses on the Middle Stone Age from the Cape coast of southern Africa and presents new data from the region, helping to place this important period of our evolution in context.

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Chapter 1: Modern Human Origins

> *As the great English historian G. M. Trevelyan has said, 'Man's evolution is far more extraordinary than the first chapter of Genesis used to lead people to suppose. It is a mystery unsolved, yet it is a solid fact. It is divine, diabolic, in short, human.' And, I may add, it is mostly African.* - J. Desmond Clark [1981]

Why does this matter? Why do we need to know how long we have been us and where we come from? It might be better to ask why we do not know more than we do about the origin of our own species. Darwin (1871) felt that the greatest mystery of evolution generally was that origin. It is somewhat surprising that we currently know more about the dead-end Middle Pleistocene hominids of Western Europe than we do about our earliest conspecific. In this chapter I provide an overview of what we do know about the first *Homo sapiens*. In this dissertation, generally, I place early *Homo sapiens* along the Cape coast of southern Africa (Figure 1.1) in archaeological context. As part of that contextualization I examine some long-held assumptions regarding the behavior of those people and test some of the aspects of one of the widely published explanatory models, the Late Upper Pleistocene Model (Henshilwood and Marean 2003), of the emergence of modern behaviors. A variant of the Late Upper Pleistocene Model, the Neural Advance Model (Klein 1999, 2000) has been especially well-articulated and it is that variant that I examine most closely. In addition to examining existing models and assumptions I provide new and relevant data and propose some alternative explanatory models and frameworks.

My research began as a tightly conceived plan to examine Still Bay technology as part of the Middle Stone Age (hereafter MSA). It soon became clear, however, that the assemblages that I had available for study often lacked the kind of context required for normal comparative studies. I then focused on applying innovative methods to largely over-looked assemblages for much of my research. A new and very well-excavated MSA assemblage became available to me as part of my on-going participation in the Mossel Bay Archaeology Project and that is reported here as well. As archaeologists it is impossible for us to predict what will come out of the ground and, to this point, the period of time of my original research focus has not yet been recovered. While taken together the set of studies presented here seem only loosely related, they are all joined by the general theme of placing our early evolution along the Cape coast in context.

Modern Human Origins

There were, until recently, two major opposing hypotheses for the origin of our species; the "Out of Africa" hypothesis and the "Multi-regional" hypothesis. The "Out of Africa" hypothesis, also referred to (more correctly) as the "Out of Africa 2" (Stringer and McKie 1996) hypothesis (accounting for the at least one earlier

Homo exodus from Africa), the “African Eve” hypothesis, or the “Replacement” hypothesis, holds that *Homo sapiens* evolved in Africa and nowhere else and then migrated to all other parts of the globe with miniscule or no genetic contribution from other hominid species and rapidly replaced them. There are several models to explain the timing of this evolution in Africa and they will be described later in this chapter.

The “Multi-regional” hypothesis holds that *Homo sapiens* evolved in Africa, but through gene flow and hybridization modern peoples in regions of the world outside of Africa retain genetic contributions from indigenous hominids, *Homo erectus* in East Asia and *Homo neanderthalensis* in Europe. This hypothesis has a strong form and a weak form. The strong form holds that indigenous hominids made a substantial genetic contribution to regional modern populations; essentially that *Homo sapiens* has been the only hominid species extant since at least 1.8 million years ago and that the modern form evolved in several places at once, through gene flow. The weak form holds that some genetic contribution of some kind was made by local “archaic” populations to the earliest local anatomically modern ones. All proponents of this model have shifted to increasingly weaker forms as new evidence is accepted, that makes stronger forms of this hypothesis increasingly unlikely (Pearson 2004). If it is agreed that the vast majority (if not the entirety) of the genetic origin of *Homo sapiens* is African and the debate has become one of statistically remote possibilities, then the debate is essentially over. For the remainder of this dissertation I will take the position that the crucial understanding needed to move the research into our origins further along is the one of that African past. In so doing I will then address and evaluate the competing models for that African origin in light of current research.

Archaeology, Morphology, and Genetics

There are three forms of evidence that have been brought to bear on each of these two major hypotheses; archaeological, morphological, and genetic. The evidence from Africa, with an emphasis on southernmost Africa, is summarized here. The archaeology is the most abundant and weakest evidence to support or reject either hypothesis. This is true for a number of reasons:

1. It is almost always unclear which hominid created the archaeological record at any one given site. This is not a problem when only one hominid is on the landscape, but for questions of replacement and culture contact this is inherently not the case.
2. Many of the “markers” of modern behavior in the material record, adornment, art, composite tools, etc., are frequently made at least partially of organic materials. For issues of modern human origins the sites of interest are by definition quite old and preservation of organic artifacts is unfortunately rare. As such stone tools dominate the assemblages of the periods of time of interest to this problem and these are not ideal repositories of information on human social systems.

3. Stone tool technologies have exhibited many similarities between hominid species. Some of the same techniques that mark Neandertal tool-making, such as the Levallois technique, are also utilized by modern humans in Africa. As such single stone artifacts and even whole assemblages, taken out of broader context, may provide little information on the cognitive differences between hominid species.
4. At some level all explanations for modern human origins have at their root some change in social organization, whether it be in exchange as a risk reducing strategy (Deacon and Wurz 1997, Deacon and Deacon 1999, Ambrose and Lorenz 1990), development of complex language and improved cooperation (Klein 1999), demographic reordering (Caspari and Lee 2004), or increasing use of symbols for inter- and intra-group signaling (Watts 2000, Henshilwood *et al*. 2004, Henshilwood and Marean 2004). Presently, the temporal resolution of the MSA archaeological record and the frequent lack of organic preservation are poorly suited to explore models of social organization and change.

The archaeological evidence from the Cape Coast that figures prominently in any discussion of modern human origins is, nonetheless, impressive. From most recent to oldest some of the archaeological phenomena that often enter into this discussion are described here. Technologically the Howiesons Poort sub-stage (Table 1.1) includes backed pieces made on small blades and true bladelets that evidence increasingly shows were hafted as parts of composite tools (see Chapter 6). Both backing of lithics and the creation of composite tools are considered advanced technological innovations. The Howiesons Poort dates to around 60,000 BP (Feathers 2002, Tribolo 2003) and has been the subject of much speculation due to its early date and seeming technological precociousness. Watts (2000) has noted the increase in mineral pigment use and color variability during the Howiesons Poort and interprets this as increasingly symbolic behavior. A detailed discussion and further expansion on the explanatory models of the Howiesons Poort is presented in Chapter 4.

Predating the Howiesons Poort is the Still Bay sub-stage, dating to around 75,000 BP (Henshilwood *et al*. 2001a, 2002, 2004, Tribolo 2003, Feathers, personal communication). The Still Bay is noted artifactually for the presence of bifacial points with strong evidence that these were hafted. These points are frequently finely made and were compared in the early literature to the Solutrean points of Europe (Burkitt 1928). Also occurring in Still Bay assemblages are worked pieces of ochre, most notably from Blombos Cave (Henshilwood and Sealy 1996, Henshilwood *et al*. 2002), but also from Hollow Rock Shelter (Evans 1994) and from Cape Hangklip (Malan n.d.). Also from the Still Bay layers at Blombos Cave are drilled marine shells that are interpreted by their analysts as personal adornment, perhaps once strung as a necklace (Henshilwood 2004, Henshilwood *et al*. 2004, d'Errico *et al*. 2005). Hollow Rock Shelter also yielded what was apparently a cache of small quartz crystals. A detailed discussion of Still Bay lithic technology and its archaeological context is presented in Chapter 5.

Deeper yet at Blombos Cave a series of finely worked bone points and awls has been dated to at least 85,000 BP (d'Errico *et al*. 2001, Henshilwood *et al*. 2001b). Other bone tools from the MSA have been reported from Klasies River (Singer and Wymer 1982, Wurz 2000) and have been observed in MSA surface sites (see an example from Blombos Sands in Chapter 5). Fine bone working has long been espoused as a defining technological characteristic of behaviorally modern peoples (Mellars 1989). Taken together the MSA of the Cape Coast has yielded the earliest well-dated unambiguous examples of symbolic marking, personal adornment, hafted bifacial points, finely worked bone tools, and composite tool manufacture in the global archaeological record.

In the countervailing view the technology of the MSA is said to be static and unchanging for long periods of time (Klein 1999). "Their artifact assemblages varied remarkably little through time and space" (Klein and Edgar 2002:230). In this view the precocious technologies of the Blombos Cave bone tool industry and the Still Bay and Howiesons Poort lithic industries are anomalies that are not representative of the MSA or are simply not addressed. An important aspect of this view is that the typologies of the MSA are less complicated than those of the Upper Paleolithic or the Later Stone Age (hereafter LSA). This fails to account for the fact that typologies are created by archaeologists for specific reasons and are not inherent in the technologies themselves. In the case of the MSA the main goal of the typologies was to differentiate MSA and LSA artifact assemblages; something that required only simple systematics. Additionally, within the stone tool technology of the southern African MSA is virtually everything that can and has been done when knapping stone; something that is not mentioned by the proponents of this view. I address in the following chapter in more detail why the MSA record may *appear* to be static to some and why this appearance is likely the result of the quality of data that were available until very recently.

The faunal assemblages from Cape MSA sites have also figured prominently in discussions of modern human origins. Large MSA faunal assemblages from Klasies River, Nelson Bay Cave, and Die Kelders have been analyzed and published. Additional large faunal assemblages are currently under analyses for Blombos Cave and Pinnacle Point 13B and have yet to be published. The patterning of faunal exploitation from these MSA sites has been used by Klein (1976, 1979, 1992, 1994, 1995, 1999) to argue forcefully that MSA peoples were inefficient hunters in comparison to subsequent LSA peoples in the same region, and thus were somehow less than fully modern in their behaviors. This argument has two parts. First, that the number of species being exploited is smaller and, second, that certain species, such as adult cape buffalo (*Syncerus caffer*) and bushpig (*Potamochoerus porcus*) are being avoided. A careful analysis of the faunal data used to reach this conclusion is presented in Chapter 3. It is found in that analysis that the faunal patterns are poor markers of behavioral modernity, good markers of climatic change, and better explained through the application of foraging theory models than through human cognitive changes.

The second line of evidence used to test the two hypotheses for modern human origins is skeletal morphology. Supporters of the “Out of Africa” hypothesis note continuities in the skeletal morphology of African populations that occur nowhere else, that the earliest modern peoples in Europe were “more African” in their morphology than later modern peoples (Holliday 1997), and that any similarities in skeletal morphology to preceding archaic *Homo* populations outside of Africa is the result of convergent evolution under similar environmental stresses or of retained traits from an ancient common ancestor. Proponents of the “Multi-regional” hypothesis counter that the earliest *Homo sapiens* material from Africa is outside the metrical range of living populations, demonstrating it is as archaic as the archaic *Homo* populations of other continents (Frayer *et al*. 1993, Wolpoff and Caspari 1997). However, this idea that the early African *Homo sapiens* material is metrically non-modern has been addressed and rejected on metrical grounds (Bräuer and Singer 1996).

The earliest skeletal materials assigned to *Homo sapiens* are all African. The oldest skeletal material in the world that has been attributed to *Homo sapiens* are the Omo materials from near Lake Turkana, Ethiopia which has recently been re-dated to 196,000 years ago (McDougall *et al*. 2005). The second oldest *Homo sapiens* material (which was the oldest for about a year) is from near Herto, Ethiopia and has been dated to between 154,000 and 160,000 years ago (Clark *et al.* 2003, White *et al*. 2003). Skeletal material from southern African MSA sites that has been identified as *Homo sapiens* includes several fragmentary individuals from Border Cave (Beaumont *et al*. 1978, Beaumont 1980, Morris 1992, Pearson and Grine 1996, Pfeiffer and Zehr 1996, Sillen and Morris 1996) and Klasies River (Singer and Wymer 1982, Rightmire and Deacon 1991, Grine *et al*. 1998), teeth from Die Kelders (Grine 1998, 2000) and a handful of material from Pinnacle Point 13B (Marean *et al*. 2004). The dating of this material has long been recognized as problematic, but the application of multiple dating methods has led to a consensus that at least some of the Klasies and Border Cave material is older than 100,000 years and the balance of the Klasies material is older than 60,000 years.

General features such as cranial capacity, tooth size, and overall stature, when they can be derived from this material, fall within the range of modern (Holocene or living) African populations (Bräuer and Singer 1996). Marked differences from Neandertal populations are often noted as well. These differences are noted in the absence of traits considered common in Neandertal populations, such as a retromolar space, or in the presence of traits considered modern, such as a prominent chin. The sample of Pleistocene skeletal material from southern Africa is as small as it has been influential in developing evolutionary explanations. Due to this small sample size population scale questions of variability and change through time are difficult to assess. The *same* variability has been interpreted as (a) exactly the kind of variation that would be expected from the founding modern population (Smith 1992) and (b) having no discernible relationship with living populations at all (Wolpoff and Caspari 1997). Additionally, Trinkaus (1993) has noted that there is little reason to believe that a modern human population from the Upper Pleistocene would be morphologically similar or identical to any recent modern population.

Teeth are an especially resilient and useful part of the skeleton for assessing population membership. Due to the hardness and durability of teeth they are the most frequently preserved and identified human element in MSA deposits. As markers of descent, teeth are useful because their morphology is complex and resultant from multiple genetic loci (Turner 1985, 1987). Irish (1997) evaluated the relatedness of living populations around the world and found that in dental morphology sub-Saharan African populations exhibited the most diversity and in cladistic analyses form the oldest lineage in modern dentition. This study closely matches the results of the genetic studies discussed below.

Genetics, the final line of evidence on the origins of modern humans problem, is the most recently developed, the most difficult to apply, and has, in a relatively brief period of time, greatly influenced the way we think about those origins. It was first applied to modern human origins in a seminal paper (Cann *et al*. 1987) in which the mitochondrial DNA (mtDNA) from living populations was assessed for in-group and between-group similarity. As the mtDNA was assumed to not be under selective pressures and is inherited without recombination, these differences in variability would represent time-depth for each group's lineage. Further, by comparing all groups to the mtDNA in chimpanzees, and by accepting a set rate of mutation through time, an estimated age of last common ancestor for all living humans was arrived at. Cann *et al*. (1987) reported that the group with the greatest time depth was African and that all people living today descended from a related group of African females that lived between 200,000 and 100,000 years ago.

Initially this study was attacked on methodological grounds, that the authors had used African-American samples as a proxy for African ones and that the program used to assemble likely descent was flawed, it gave different answers based on the order that the data were entered (Hedges *et al*. 1992, Templeton 1993). This study has been redone, with similar results to the original flawed study (Stoneking and Cann 1988, Vigilant *et al*. 1991). Harpending *et al*. (1998) utilized both mtDNA and microsatellites on the Y chromosome to determine that our ancestors underwent a rapid population expansion about 100,000 years ago. They concluded that the population expansion was after some bottleneck event, that it occurred in Africa, and that it is completely incompatible with any version of the Multi-regional Hypothesis. A large number of genetic studies of this type, based on living populations, has reached similar conclusions that there is a single origin for our species, and that Africa is the site of that origin (Stringer and Andrews 1988, Cavalli-Sforza *et al.* 1994, Cavalli-Sforza 1997, Disotell 1999, Pääbo 2003, Pearson 2004).

Another type of genetic study, based on the recovery of ancient DNA, has also recently been successfully applied (Hofreiter *et al*. 2001). Krings *et al*. (1997, 1999, 2000) recovered mtDNA from the Neandertal type-specimen and other samples. They report no affinity to any living population and estimate separation from the *Homo sapiens* lineage of around 500,000 years, which predates the initiation of the MSA in Africa by at least 100,000 years. Knight (2003) similarly finds Neandertal genetic evidence to be conclusively on the side of population replacement. Carmelli *et al*. (2003) continue in this vein, successfully extracting mtDNA from two late Upper Pleistocene *Homo sapiens* skeletons from Europe. They found that the mtDNA for these samples falls within the modern range and bears no affinity to Neandertal mtDNA from four samples. They concluded that there was no genetic continuity between Neandertal and modern European populations. This type of study will be expanded in the future to necessarily include samples from the African MSA. To date no African ancient DNA has been successfully recovered.

Adcock *et al*. (2001) extracted mtDNA from ancient Australian skeletal material from ten individuals and found one sequence that does not currently appear to exist in living populations anywhere (and four that do). They interpreted this to mean that the population that colonized Australia diverged from the global population prior to the modern mtDNA genome being "set". While an interesting study the final interpretation is ambiguous. We have very little knowledge of the mtDNA sequences of early anatomically modern peoples and do not know what other lineages have been lost through a variety of evolutionary processes. In this case we do know that nine out of ten of the ancient Australians belonged to mtDNA lineages that are extant today, not a result that requires much explanation. Perhaps as importantly a more vigorous program to catalog the mtDNA variability of ancient, living, and recently extirpated African populations will be necessary to evaluate these results more thoroughly. The National Geographic Society is currently undertaking a five year project to collect 100,000 genetic samples from living peoples globally, including a large sample from sub-Saharan Africa.

Templeton (2002) attempted to make sense of the patterning in all of the genetic studies available at that time. He gave equal weight to studies on modern and ancient populations and to studies on nuclear DNA and mtDNA, and threw in some assumptions based on skeletal distributions. His resultant model, “Out of Africa Again and Again”, proposed that a weak version of the Multi-regional Hypothesis best explained the pattern, with repeated expansions out of Africa over the past one million years. His interpretation of the data is problematic, however, in that he relied on the nuclear DNA data for all of the evidence for earlier population expansion and for the contribution of regional “archaics” to the modern genome. This type of data are not as well-suited for use as a molecular clock as mtDNA, because of the possibility of recombination and unknown mutation rates. We do not know what types of evolutionary processes led to the nuclear DNA patterns observed in those studies. Furthermore, the evidence from mtDNA and Y-chromosome DNA, even as presented by Templeton (2002), strongly support a single African origin of our species between 100,000 and 200,000 years ago.

Eswaran *et al*. (2005) provide a model that shows how it is mathematically possible for genes and phenotype to flow between populations without population replacement *per se*. Their model assumes that interbreeding between various species of *Homo* was not only possible but that it was the norm throughout prehistory, that population densities were uniform and high across the Middle and Upper Pleistocene Old World, and that some selective advantage that arose in African *Homo* populations was somehow linked to the *Homo sapiens* phenotype, but only loosely tied to the overall *Homo sapiens* genotype. Not one of these assumptions is demonstrable in the archaeological, fossil, or genetic record. In any case their model purports that the important part of “being modern” flowed from Africa.

In summary, the genetic evidence strongly supports a single African origin for all peoples living today. If these studies are flawed, as multi-regionalists suggest, it is curious that they are *all* flawed toward the same result and that result is fully supported by the archaeological and skeletal evidence. It is interesting that the regional ancient *Homo* population that we know the most about genetically, Eurasian Neandertals, now seems the least likely to have made any contribution to living populations. Taken together, the archaeological, morphological, and genetic evidence fit only the “Out of Africa” hypothesis in explaining the origin of our species. What remains to be determined are the where (in Africa), when (during the MSA), why, and how of that event.

Location and Timing

Any reasonable hypothesis for modern human origins, both cultural and anatomical, has at its minimum the overwhelming representation of Africa at its roots. Even the long-lived alternative to the “Out of Africa” hypothesis, the “Multi-regional” hypothesis chiefly supported by Wolpoff (Wolpoff and Caspari 1997), has moved to increasingly weaker forms, accepting the majority of genetic input from Africa in global *Homo sapiens* populations (Relethford 1999, Pearson 2004). We are an African species and have been behaving in modern ways in Africa tens of thousands years longer, and potentially much longer than that, than anywhere else. As stated recently by Mellars, "…it is now possible to show beyond any reasonable doubt that many of the most distinctive archaeological hallmarks of the classic Middle-Upper Paleolithic transition in Europe can be documented at least 30,000 to 40,000 years earlier in certain parts of Africa than in anywhere in Europe itself" (2005:16). Virtually all of the current debate on the timing and coincidence of the events that define modernity involves African data. As the main unifying theme of this dissertation I utilize a set of evidence from the Southern Cape (that "certain part of Africa") to examine the proposed models for our African origin.

The debate over the location within Africa where we first evolved persists and is summarized here. Although this debate is important, it will surely not be resolved for a very long time. This is because gene flow between early *Homo sapiens* populations, especially among those south of the Saharan desert, is likely to have occurred before, during, and after the Upper Pleistocene. In addition, while one population of thousands of individuals in a discrete area is likely to be the parent population of all peoples living today (Harpending *et al*. 1997, c.f. Harris and Hey 1999) other anatomically modern contemporaries without living descendents, are likely to have had advanced material cultures. They may also have had DNA lineages that have some representation today (through the founder population). The strengths, weaknesses, and biases of each major region are summarized here.

1. East Africa currently has the oldest dates for unambiguously *Homo sapiens* skeletal material (McDougall *et al*. 2005, Clark *et al*. 2003, White *et al*. 2003). These specimens from Ethiopia have been dated to as old as 196,000 years ago. But this part of the continent has benefited from unique geologic exposures, suitability for volcanic-dating (Tryon and McBrearty 2002), and relatively frequent fossilization along with a sustained presence of dedicated researchers (for example the Leakeys) may overemphasize this area's primacy.

2. Abundant evidence for the earliest modern behaviors and a cluster of very early *Homo sapiens* skeletal material are extant in southern Africa (Singer and Wymer 1982, Henshilwood and Sealy 1997, Henshilwood *et al*. 2001a, 2001b, 2004, d'Errico *et al*. 2001, 2005, Watts 2000). As in East Africa, southern Africa has benefited from sustained research from the early twentieth century onwards (Dale 1870, Leith 1898, Stapleton and Hewitt 1927, 1928, Goodwin 1927, 1928, Goodwin and Van Riet Lowe 1929) and, while lacking volcanism, complements East Africa with its abundant caves. Recently, application of luminescence dating has placed the archaeology of the Upper Pleistocene in better chronological contexts (Feathers 2002, personal communication, Tribolo 2003, Jacobs 2004).

3. Tropical Central Africa has hardly been examined but there is no reason that our ultimate origins could not be there. The southern part of that region has yielded some of the earliest evidence for both MSA bone tool manufacture and fishing (Brooks *et al*. 1995, Yellen *et al*. 1995, Yellen 1996). The lack of political stability, infrastructure, ground visibility, organic preservation, and, surprisingly, academic interest has conspired with the short-comings of current archaeological techniques to leave this region virtually unknown for the relevant time-frame.

4. Usually excluded almost arbitrarily for not being in sub-Saharan Africa, North Africa seems the least likely of the regions, but frequent lack of organic preservation, lack of volcanic geology, and the presence of some of the most spectacular of ancient civilizations have tended to divert research away from modern human origins. The site of Jebel Irhoud in Morocco has provided some early dates on *Homo sapiens* material (Grün and Stringer 1991) that are potentially as early as the southern African materials or as late as those from the Levant. If North Africa is the region that gave rise to us, then some intriguing scenarios for sustained interspecies culture contact with Middle Paleolithic Eurasia become possible, but currently have no support in the archaeological record.

Accepting that we are an African species a focus on the timing and order of the events of our evolution becomes the key to modern human origins research. Indeed, for Africanists working on this issue, this is *the* problem to be solved. Two events (which may or may not have been separate); when we became anatomically modern and when we became behaviorally modern in Africa, are considered the key to understanding when we became us and why. For the timing of modern human development four possibilities are plausible and have been recently summarized by Henshilwood and Marean (2004) as the following models.

1. Late Upper Pleistocene Model (Neural Advance Model), (Klein 1999, Ambrose 2001): Modern behavior is a relatively late development. Physical modernity (minus a gene or two) is accepted for the oldest "archaic" *Homo sapiens*, but modern behaviors develop between 40 and 50 kya (ignoring the limitations of ^{14}C and its effect on this "cluster" of evidence). This possibility is increasingly at odds with the archaeological evidence, makes little sense in the context of most genetic studies, and is difficult to reconcile with evolutionary biology (but see Foley and Lahr 2003 for an explanation of how this may be). Coolidge and Wynn (2005) have proposed a version of this model that is based on changes in the executive functions of the brain and is manifest in some artifact types. They have a broad time range for when this mutation could have occurred

and their version of this model is not necessarily at odds with earlier models.

2. Early Upper Pleistocene Model (Gradualist Model), (McBrearty and Brooks 2000): Modern behavior is gradually accumulated over time after physical modernity arises, but is evident tens of thousands of years before the Late Model. This possibility, most thoroughly articulated by McBrearty and Brooks (2000), matches all classes of evidence well. Its main weakness is that it is inductively derived from the archaeological record, and as such reifies the myriad biases in preservation, recovery, and dating. It is such a tight fit with the existing evidence that it will need to be constantly remade to match new information.

3. Earlier Upper Pleistocene Model (Early Model), (Deacon 1989, Henshilwood and Marean 2004): Modern behavior and anatomy were roughly coincident greater than 100 kya. This proposition has numerous minor variants in timing and location. It has remained robust over time in the context of new archaeological and genetic data, and has benefited greatly from newer dating techniques extending into this period.

4. Middle Pleistocene Model (Earliest Model), (Foley 1987, Deacon 1988, Foley and Lahr 1997): Modern behavior precedes modern anatomy by

> some time. The beginning of the MSA is taken to be the marker for modern behavioral capacity. This has been pushed back as far as 280 kya in East Africa (Tryon and McBrearty 2002), nearly 100 kya earlier than earliest accepted *Homo sapiens* (McDougall *et al*. 2005). This proposition makes sense in the context of evolutionary biology, where changes in behavior frequently precede anatomical change. That is, speciation occurs behaviorally before it does physically. The time-frame critical for addressing these issues, 350 to 125 kya, is virtually unknown in many parts of Africa. The coastal caves of the Cape, having frequently been scoured by high sea-stands during OIS 5e, only rarely contain archaeological materials from this period.

In the following chapters of this dissertation I will apply the archaeological evidence from one of these regions, southern Africa (and specifically the Cape Coast), to the problem of the timing of modern human origins. I accept that an earlier origin may occur in another region (or regions) of Africa. But, I will address this problem for the area from which most of these models have been developed and previously applied.

Behavioral Modernity

Darwin warned us not to think of humanity as removed from natural selection, and not to make special rules explaining how we came to be:

> Man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system- with all these exalted powers- Man still bears in his bodily frame the indelible stamp of his lowly origin. [1871]

But the temptation to do so seems to be impossible to resist and so the concept of "behavioral modernity" was developed. That is, our advanced intellect and complicated social behaviors make us a "special case" in evolution, a *deus ex machine* explanation. Or, as the evolutionary biologist Roger Lewin has said, "…the argument must be recognized as special pleading with no empirical basis" (1998:113). This concept was originally developed as an explanatory tool for the Middle Paleolithic to Upper Paleolithic transition in Europe and Marean and Assefa (2004) trace its origins to a paper by Paul Mellars (1973). It has as its basis the idea that biological evolution and behavioral evolution in *Homo sapiens* might not be closely correlated in time. This idea has become so widespread in its uncritical acceptance that more standard evolutionary biological views, that behavioral changes are likely to *precede or coincide* with morphological changes, have become minority positions in paleoanthropology. This concept of separate behavioral and biological evolutionary time-frames is also useful in restoring importance with regards to modern human origins to the Upper Paleolithic record of Europe and it should be noted that it was developed just as early dates for African *Homo sapiens* were becoming widely accepted. That is not to say that it is not possible that we evolved our physical form over 100,000 years earlier than our modern intellectual capacity; only that as a case of special pleading the onus is on proponents of this view to clearly demonstrate the evidence for this. In this dissertation I argue that this has not been done, that the kinds of evidence most often cited is poorly suited to address this issue, and that evidence well-suited to address this issue is at direct odds with the late emergence of modern behavior.

"Behaviorally Modern" is a multivariate concept and one that is profoundly vague. Behavior is made up of technology, customs, language, cuisine, intellectual capacity, and many other parts. It may be more useful to identify aspects of the archaeological record that are technologically modern or modern in problem-solving, rather than the whole bundle at once. While this may sound just like another list-making approach it is actually just the opposite. Traits here represent capacity, rather than things that are necessary to attain. Our question then becomes: “is there evidence that these people had a modern capacity for doing things?” rather than “are these people doing things the same ways modern peoples do?” How we ask these questions is more than just semantics, capacity requires types of data other than single artifacts or single sites to address it. It also requires that the totality of what we know about MSA people be viewed together; that each class of evidence or each assemblage be used to provide context for every other. I try to do this for the Still Bay specifically and for the MSA generally in this dissertation. The data I present on a number of Still Bay assemblages provide context for the well-excavated and dated site at Blombos Cave. The Blombos Cave site in turn provides context for the other Still Bay assemblages. Taken together we can draw more inferences on the behaviors and capacities of Still Bay peoples than we could if each set of data was viewed alone.

Table 1.1: Sub-stages of the MSA for the Cape Coast, adapted from Wurz (2002) with my own additions marked*.

Singer & Wymer	**Volman**	**Wurz**	**Sites/Layers**	**Age estimates**
MSA III & IV	MSA 3/4	Post-Howiesons Poort	KRM (Upper), Rose Cottage Cave, Sibudu, Ysterfontein	55-35,000
HP	HP	Howiesons Poort	KRM (HP), Howiesons Poort shelter (S&H)	65-55,000
*		Die Kelders	Die Kelders, Howiesons Poort shelter (D&D)?	70-60,000
		Still Bay	Blombos Cave (M1), Dale Rose Parlour	79-69,000
*		Blombos	Blombos Cave (M2)	?
MSAII	MSA 2b	Mossel Bay	KRM (SAS)	72-68,000 (too young??)
MSA I	MSA 2a	Klasies	KRM (LBS)	>120-105,000
*	MSA 1	?	Border Cave, Peers Cave?	?
*		?	Blombos Cave (M3)	?

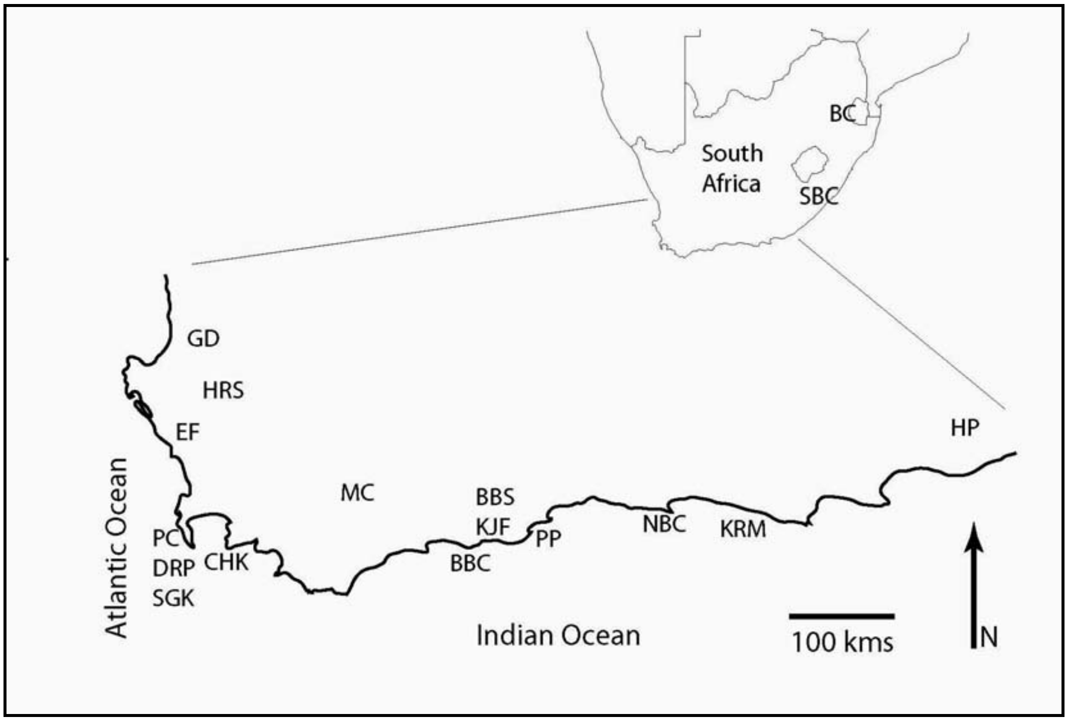

Figure 1.1: Map of southern Cape of South Africa with MSA sites mentioned in this dissertation marked. Border Cave (BC), Sibudu Cave (SBC), Geelbek Dunes (GD), Hollow Rock Shelter (HRS), Elandsfontein (EF), Peers Cave (PC), Dale Rose Parlour (DRP), Skildergatkop (SGK), Cape Hangklip (CHK), Montagu Cave (MC), Blombos Cave (BBC), Blombos Sands (BBS), Kleinjongensfontein (KJF), Pinnacle Point (PP), Nelson Bay Cave (NBC), Klasies River main site (KRM), and Howieson's Poort shelter (HP).

Chapter 2: The Middle Stone Age

…the fascinating processes of our own becoming - Lewis R. Binford [1984:266]

The MSA is defined both technologically and chronologically as being intermediate to the Earlier Stone Age (hereafter ESA) and LSA in Africa (Goodwin 1928, Goodwin and Van Riet Lowe 1929, Sampson 1974, Deacon and Deacon 1999). Based on the both the technology present and the morphology of the associated hominids the MSA was initially judged to be equivalent to or contemporaneous to the Upper Paleolithic of Europe (Klein, 1970:132). This interpretation was reinforced by erroneous radiocarbon estimates (see Klein 1970: Table 1 for an early compilation). Sampson (1974) reassessed the MSA as equivalent to the European Mousterian on broad chronological grounds. And, when it became clear that anatomically modern people had much greater time depth in Africa than in Europe, the MSA was broadly accepted as essentially equivalent to the European Middle Paleolithic (Klein 1999). Wurz (2000) provides a clear and cogent critique of the Euro-centrism and backlash against failed expectations at play in many of these reinterpretations. McBrearty and Brooks (2000) also convey eloquently a countering view to that forcefully proposed by Klein and others that even if the African hominid record is much deeper, much of that depth has no relevance to the origin of modern humans.

When the earliest taxonomic system was proposed for Africa it had only the Earlier and Later Stone Ages (Goodwin 1926). The Earlier Stone Age (hereafter ESA) was defined largely by the presence of large bifacially flaked tools, most notably the Acheulean hand axe. It continues to be defined that way today. The LSA was defined by the presence of microlithic technologies, including bladelet production. As our understanding of LSA technology has increased it has incorporated a wider range of tool manufacture spanning the past 40,000 years or so. The Middle Stone Age was soon defined as being intermediate between the ESA and LSA, both temporally and technologically (Goodwin 1928a, 1928b). This original definition of the MSA was largely a negative one. That is, the MSA was defined by what it was not, rather than by what it was. In this scheme the MSA began when assemblages no longer contain handaxes and continued until microlithic production was undertaken. It is only later that the unique aspects of the MSA were recognized and incorporated into a positive definition of the MSA as being blade-based, rather than flake-based, and that the preparation of cores in Levallois-like ways becomes common (Goodwin 1946, Mason 1962, Sampson 1974, Inskeep 1978, Deacon and Deacon 1999, Mitchell 2002a). Some aspects of the old definition are still retained today and this helps to further muddy the questions of when and how the transitions between the ESA and MSA (Tryon and McBrearty 2002) and the MSA and LSA occurred (Wadley and Jacobs 2004, Villa *et al*. 2005).

That these transitions are muddy, that they are patchy in time and space and not abrupt like those between the Middle Paleolithic and Upper Paleolithic of Eurasia (Bar-Yosef 2002), does offer some insight into their nature. It has been noted that only in Africa does this long technological evolution seem to play out in a continuous sequence, albeit one with fits and starts. It is argued that this supports the African origins of our species (Foley and Lahr 1997, 2003, Marean and Assefa 2004). In reference to the question of modern human origins the MSA to LSA transition is of interest as this is Klein's main marker of modern behavior. This transition does not seem to have occurred either when the Neural Advance model (Villa *et al.* 2005, Chapter 7 this volume) requires or in a uniform way across Africa (Marean and Assefa 2004).

MSA on the Cape Coast

The archaeological record for the MSA of the Cape Coast of southern Africa is summarized here. Sites in this region tend to be either in coastal caves, dune fields, inland rockshelters, or, rarely, as buried open sites.

Coastal Caves

Coastal cave sites are located in caves cut by wave action into the quartzitic sandstone bedrock of the region. As such they tend to be near modern sea-level and to face the ocean. Some well-known examples of caves of this type are the Klasies River mainsite, Blombos Cave, Nelson Bay Cave, and Die Kelders

(Figure 1.1). High sea level stands in the past, such as OIS 5e 125,000 years ago, often removed older archaeological deposits, as has been well-documented at Klasies (Singer and Wymer 1982). This is not always the case and caves such as Blombos Cave and Pinnacle Point 13B that sit higher than the OIS 5e sea stand contain older deposits. The quartzitic sandstones that are the parent material of these caves are acidic. Groundwater flowing through these caves and their archaeological deposits, if unbuffered, destroys organic artifacts, and faunal remains. Fortunately, in some locations the bedrock formations are capped by a layer of calcrete, a calcium carbonate rich soil, which buffers the groundwater resulting in better faunal preservation. The shelter at Ysterfontein 1 on the Atlantic coast (Figure 1.1) is itself cut into a calcrete bank, providing excellent bone preservation (Halkett *et al.* 2003, Klein *et al.* 2004)

Dune Field Sites

Large amounts of MSA material have been recovered from the dune fields that are common along the Cape coast. The oldest collections from the region were collected in the dune fields around Cape Town called the Cape Flats in the middle and late nineteenth-century and were attributed to the grab-bag “Cape Flats culture” (Dale 1870). Dune field MSA assemblages are known from the Still Bay area and include Kleinjongensfontein and Blombos Sands. A large MSA assemblage was recovered from the dunes at Cape Hangklip and MSA artifacts are known from a number of other dune fields in the region, including

Elandsfontein (Klein and Cruz-Uribe 1991) and Geelbek Dunes (Conard *et al.* 1999) (Figure 1.1). Dune sites are notoriously difficult to date accurately as periods of exposure and reburial are likely. Dune sites also tend not to preserve organic materials (although there are exceptions, see the fauna from Elandsfontein or the bone point from Blombos Sands). Dune sites have the potential to contain a different set of activities than those in the confined spaces of caves and some effort to compare what appear to be contemporaneous cave and dune sites near Still Bay is attempted here, but with poorly documented dune collections and no access to the unpublished cave data. A coordinated effort to collect and record dune materials in the area and directly compare artifacts, including raw material sourcing and through refitting, seems to be required to work through this relationship in a satisfactory way.

Inland Rockshelters

Caves and rockshelters that are not adjacent to the coast present a different set of problems and benefits from coastal cave sites. Unlike coastal caves these sites are not subject to the loss of deposits due to higher sea levels. Longer sequences of occupation with much greater time-depth are possible. These shelters are also formed in a wider variety of geologic formations, some of which are alkaline or neutral and preservation of organic artifacts is possible. Even spectacular organic preservation is present in some cases, like Diepkloof shelter (Parkington and Poggenpoel 1987). Conversely, some of these caves and shelters are formed in acidic geologic formations and the buffering calcrete deposits common on the coast are often lacking, resulting in no organic preservation at sites like Dale Rose Parlour and the Howieson's Poort shelter (Figure 1.1). As the areas immediately adjacent to these sites were not being dramatically altered by sea level change (for example, a foreshore area becoming coastal grassland) as the areas adjacent to coastal caves were, it is likely that some periods of time that are poorly represented in coastal caves will be the focus of human use of these inland sites. It is possible that even when occupied at similar times or even by the same set of people the artifact assemblages at inland and coastal caves could be quite different due to the different sets of local food resources and tool materials present in each local setting.

Buried Open Sites

Buried sites that were in the open at one time, with the exception of dune field locations, are virtually unknown for the MSA in the Cape coast area. While it is recognized that sites of this type have contributed greatly to our understanding of prehistoric sequences around the world, and would probably also do so for the Cape MSA, no program for identifying and excavating this class of site has been undertaken. The recent maturation of Cultural Resource archaeology in conjunction with rapid property development in the Cape provides the best opportunity for identifying and systematically recording buried MSA sites in the near future.

Explanatory Frameworks for Interpreting the MSA

Archaeologists (and scientists in general) view their research within explanatory frameworks. Explanatory frameworks provide guiding structures for what is important to look for and record. In some ways explanatory frameworks inform us on what is possible. For example, prior to the widespread acceptance of Monte Verde as a pre-Clovis New World site (Meltzer 1997, Meltzer *et al*. 1998) there was little reason, under the prevailing explanatory framework (Clovis-first), for investigating geological deposits for evidence of human occupation that were older than 12,000 years. Consequently, in a self-fulfilling prophecy, no older sites were found. That is not to say that explanatory frameworks do not have utility. Under the current explanatory framework no sites containing pre-modern hominids are expected in the New World and so virtually no efforts are made at expensive investigations into Middle Pleistocene deposits (Calico Hills being the exception that proves the rule), and rightly so. Science requires explanatory frameworks to operate, we need the focus that they provide and the common goals and methods that they engender provide unity in a discipline, such as archaeology.

Middle Stone Age studies in southern Africa have recently undergone a framework shift comparable to that in the New World that resulted from the acceptance of Monte Verde. Again, a single site was the motor of that shift (in this case Blombos Cave), although in both cases (that of the MSA and that of the example of peopling of the New World) acceptance of the first instance has allowed for reinterpretation of previously known sites and new research goals for on-going investigations. Here I name the prevailing explanatory framework of MSA studies from the late 1970s until very recently the “Klasies Model” and the newer one, which has emerged in only the past eight years, the “Blombos Model”. Obviously, practitioners operating in the older explanatory framework will come off looking less good than practitioners operating in the newer one (as is always the case), but that is not the point. As scientists we need to accept that understanding builds on “failures” as much as on “successes” and that what we do now will always inevitably look dated in the future, at least in part because our explanatory frameworks will be long gone by then. My point here is to describe why MSA data have been interpreted the way that they have and why, in light of new findings, those same data need to be interpreted in new ways, new data need to be gathered in different ways, and we need to be open to unexpected things.

The Klasies Model

The MSA cave sites at the Klasies River Mouth (KRM) on the Tsitsikamma coast (now usually referred to as the mainsite) have proved to be both a boon and a bane to modern human origins research. The boon is obvious. The KRM sites provided what at the time were the oldest known *Homo sapiens* skeletal materials (Singer and Wymer 1982). Additionally, the MSA deposits at Klasies were massive and provided tens of thousands of lithic and faunal artifacts from gross-scale, but stratigraphically excavated, contexts. Klasies also had several lines of evidence that suggested antiquity for the oldest deposits of at least 120,000 years ago (Butzer 1982, Singer and Wymer 1982). Although Binford stated, “these dates lead me to be very uneasy about the chronology” (1984:45), they did support the only meaningful chronology for the MSA that was available until very recently. Subsequently, finer-scale excavations at KRM have confirmed many of the original observations of stratigraphy and artifact content (Deacon and Geleijnse 1988, Deacon 1995, Wurz 2000, 2003, Wurz *et al*. 2003) and luminescence dating has confirmed the general chronology of the site (Feathers 2002). The long sequence at Klasies seemed to offer a model for MSA artifact change through time that was complete and, other than the Howiesons Poort levels, exhibited little change for what appeared to be long periods of time. All models of explanation of MSA behavior had to account for the patterns observed at Klasies, whether in the faunal (Klein 1982, 1999, Binford 1984) or lithic (Ambrose and Lorenz 1990, Deacon and Wurz 1997) artifacts.

One particular Klasies pattern in the lithic assemblage was what appears to be long periods without much technological change or variability and an absence (actually near-absence is more accurate) of some of the more “modern” artifacts, such as fully bifacial points and bone tools, that had been recovered for decades in other Cape MSA sites, although often in somewhat dubious contexts. Much has been made of this apparent lack of technological change and this is linked directly by Klein (1999) to the idea that MSA peoples lacked some modern intellectual capacities until 50 – 40 kya. Klasies provided us with the correct sequence, for the materials that are present, but as we get additional well-excavated MSA assemblages and look anew at museum collections it has become clear that the Klasies sequence lacks artifacts from large periods of time. The traditional chronology for Klasies is as follows:

- At the base of the deposit is the LBS Member. The LBS is considered to be a rapid re-occupation of the caves after the high sea-stand of OIS 5e. OIS 5e is dated to around 125,000 years ago. Isotopic levels in marine shell in the LBS (Deacon *et al*. 1988), U-series dates (Vogel 1982), and luminescence dates (Feathers 2002) are all in general agreement on this scenario. This is the only point beyond radiocarbon age that nearly all of the researchers are in agreement about (and hence Binford's "uneasiness"). The artifacts in the LBS are assigned to the MSA I by Singer and Wymer (1982) and the MSA 2a by Volman. Wurz (2003) has suggested the name Klasies sub-stage for this assemblage (Table 1.1). Some *Homo sapiens* skeletal materials were recovered from the LBS and stood for decades as the oldest dated modern humans known.
- Next, above an apparent discontinuity, comes the longest depositional unit at Klasies, the SAS Member. The SAS is at some points exceeds ten meters in depth. This unit has been much more difficult to place chronologically. It has been thought of as being between the LBS OIS 5e

date (120,000 BP) and the HP date of around 60,000 BP. Shackleton (1982) used oxygen isotopes in marine shell to suggest several times during that period that it could represent. Deacon *et al*. (1988) expanded on the oxygen isotope study, with results that were only “tentative” and, in places where luminescence dates have subsequently been obtained, seem inaccurate. Generally, due to the imprecise dating of the SAS and its massive bulk it has been thought of as a deposit that accumulated over tens of thousands if not 60,000 years and hence the apparent static nature of the artifact assemblage. Feathers (2002) dated two samples from the SAS (UW-274 and UW 455) using luminescence dating and very conservative dose rate estimation. Although the samples are from different units in the SAS their stratigraphic relationship is not fully resolved, due to the large gaps in the deposit from previous excavations at the time of the sampling (Feathers, personal communication). He reported age estimates of 70.9 ± 5.1 kya and 68.4 ± 6.5 kya. It is possible that these estimates are slightly too young (when compared to U-series dates (Vogel 2001)) but they are still would be dating what is essentially a single event. Additionally, shell density studies for this member (Thackeray 1988) and microfauna (Avery 1986, 1987, 1990) suggest little climatic change during the deposition of this massive member. In particular, even though many more samples were taken for the shell density studies from the SAS than other depositional units, there is less change there than for other short-lived deposits such as the HP (Thackeray 1988). This leads me to suggest that the SAS Member is a rapid depositional event; that it is on the scale of thousands (or perhaps of hundreds), not tens of thousands, of years in duration. This has implications for interpreting the KRM and other MSA assemblages and will be discussed in more depth later in this section.

- Above the SAS Member is the RF Member. This deposit contains large amounts of roof-fall and little archaeology. Feathers (2002) reports an age estimate of 80.6 ± 17.6 kya which has a large error term and is out of sequence with the stratigraphy. Within the reported range, however, a date of 65 – 60 kya would be in agreement with the stratigraphic order and other lines of evidence.
- Above the RF Member is a deposit referred to as the Upper Member. The Upper Member contains the Howiesons Poort deposits (referred to as the HP by Singer and Wymer 1982) and above that the post-Howiesons Poort deposits. Dating of the Howiesons Poort has been an elusive goal and one which the deposits at KRM may never resolve (Feathers 2002). Age estimates of 52.4 ± 4.0 and 46.7 ± 3.3 kya are on the young side compared with other Howiesons Poort age estimates of ~60 kya (Tribolo 2004). This represents either poor age estimation for the luminescence dates at KRM or a lack of unity for the deposits called Howiesons Poort across southern Africa. Either is possible but the large HP deposits at KRM are

> clearly technologically and typologically Howiesons Poort, so much so that the site has become the type site for the sub-stage.

In summary, the Klasies Model is one in which the thick deposits of some MSA cave sites (in particular those at Klasies) are viewed as representing long spans of time (on the scale of tens of thousands of years) of continuous human utilization of those sites. Taken directly from that explanatory framework, in particular the application of it to the SAS Member at Klasies is the interpretation that the southern African MSA between 120,000 and 60,000 years ago is relatively technologically static. This interpretation came directly from the gross-scale excavation methods guided by the goal of recovering hominid remains to assess for anatomical modernity and a lack of applicable dating techniques. The traditional view of Klasies as a massive sequence that represents everything we know about the Cape MSA (the Klasies Model) is rapidly falling away and with it must go the interpretations based on that explanatory framework.

The Blombos Model

The direct application of the Klasies technological sequence to other MSA assemblages has proved difficult. Singer and Wymer's (1982) technological/typological sequence of MSA I, MSA II, HP, MSA III/IV failed to describe the known sequence at Border Cave (engendering Volman's (1981) own technological/typological sequence of MSA 1, MSA 2a, MSA 2b, HP, MSA 3/4), did not describe the variability that was already known from older sites in the Cape, such as Peers Cave, and did not match the materials that were recovered using modern excavation techniques for the thick MSA sequence at Die Kelders Cave (Thackeray 1992, 2000) or Ysterfontein 1 (Klein *et al*. 2004). Recent quantitative work by Wurz (2002, Wurz *et al.* 2003) confirms that the typology at Klasies is based on measurable traits, the fault lies in the sequence itself being very incomplete. This has been dramatically confirmed by the recent excavations at Blombos Cave (Henshilwood and Sealy 1996, Henshilwood *et al*. 2000, 2001a, 2004). Wurz (2002) has proposed a new scheme for organizing the techno-temporal units of the Cape MSA (Table 1.1).

Blombos Cave was excavated using much finer-scaled recovery and stratigraphic techniques than the Singer and Wymer excavations of Klasies. Additionally, from the onset of MSA excavations use of single-grain optically stimulated luminescence (OSL) for precise dating estimates was undertaken. Like Klasies, Blombos Cave has well-preserved fauna. The number of MSA sites in the Cape with preserved fauna that are published is surprisingly limited. Currently there are two, Klasies and Die Kelders, and there will soon be published the fauna from Blombos Cave and that from Pinnacle Point 13B (both currently the subject of Jessica Thompson’s dissertation research) and also soon those of the French team led by Jean-Philippe Rigaud excavating Diepkloof shelter (Figure 1.1). As each new, well-excavated assemblage becomes known they are in discordance with the sequence developed for Klasies, in particular that the SAS is a long-lived and stable technological stage. Of these Blombos Cave serves as the best example of how the Klasies Model has been overturned.

The MSA sequence at Blombos Cave is quite different from that at the Klasies River mainsite. The MSA here is below a dune intrusion that seals it from the subsequent LSA occupation that was the original focus of archaeological research there (Henshilwood and Sealy 1997, Henshilwood *et al*. 2001). The dune has been securely dated by single-grain and single-aliquot OSL to 65-69 kya (Jacobs *et al*. 2003). Below the dune is a sequence of deposits that have been labeled M1, M2, and M3 by the excavators. The uppermost of these, M1, has yielded an impressive number of bifacial points of the Still Bay type (Henshilwood *et al*. 2001, Soressi and Henshilwood 2004) and is sometimes referred to as the Still Bay layers. These have been dated by single grain OSL on sediments and TL on burned lithics to 74 ± 5 kya (Henshilwood *et al*. 2004). Abundant use of mineral pigments is in evidence in the M1 deposits and engraved pieces of ochre from these layers are touted as the earliest clear expression of human symbolic thought (Henshilwood *et al*. 2002). Also from the M1 layers drilled marine shells that are interpreted as having been strung as a necklace were recovered (Henshilwood *et al*. 2004, d'Errico *et al*. 2005). This is viewed by many as the oldest known personal adornment. These finds were excavated using modern methods and there appears to be no chance of intrusion from later LSA occupations of the cave.

Below the M1 is deposit called the M2 which is best known for the large number of bone tools and worked bone pieces recovered from it (d’Errico *et al*. 2001, Henshilwood *et al*. 2001b). Importantly, due to the careful work of the excavators (and to the fact that a transition was actually there), the abundant bifacial points in the M1 layers were observed to grade into the abundant bone points in the M2 layers (Henshilwood *et al*. 2001a). That is, two types of artifacts co-vary inversely. This is quite different from the nature of transitions between the depositional members at Klasies where it appears that a hiatus of occupation occurred between each major stratigraphic unit. The next set of layers at Blombos Cave is grouped as the M3. The M3 artifacts have not been well-described, but are reported to be quite different from the lower layers at Klasies which they appear to pre-date (Soressi and Henshilwood 2004). The transition between the M2 and M3 is abrupt, and in that way resembles the transitions at Klasies.

The lessons of Blombos Cave will take time to fully penetrate the research programs of southern Africa, just as the lessons of Klasies took time to penetrate the Eurocentric view of our origins. Of these lessons perhaps the most important is to remove some of our preconceptions about what is possible in MSA deposits. Rather than not expecting to find the types of things recovered from similar Holocene-aged sites (a self-fulfilling expectation, no doubt) modern excavators need to try to recover data in finer-scales and to be open to surprising finds. Not all of these will be as spectacular as those from Blombos Cave, but programs to recover MSA-aged plant and animal residues (Lombard 2005) at Sibudu Cave in KwaZulu-Natal and the recognition of hair adhering to MSA tools at Pinnacle Point Cave 13B (Chapter 7 of this volume) or the preservation of hafting adhesive residues on a Howiesons Poort artifact (Chapter 6 this volume) all owe themselves in part to this recognition of possibilities. In short, the limitations of the MSA record to address issues of behavior are increasingly being shown as our (archaeologists') limitations in recovering the appropriate data, rather than its total absence.

In summary the two explanatory frameworks for MSA studies in play in southern Africa and their major components are:

The Klasies Model

- Result of the recognition of the extreme antiquity of *Homo sapiens* in southern Africa and their strong association with the MSA.
- The thick MSA deposits represent very long continuous occupations.
- "Modern" artifacts are usually excluded as anomalous or intrusive.
- Broad classificatory schemes for technology proposed.

The Blombos Model

- Finer-scaled excavation techniques with emphasis on context.

- “Modern” artifacts are accepted as part of the MSA.
- Application of numerous dating methods to MSA.
- Recognition that extreme antiquity may not necessarily make study of organic remains impossible.
- Lessening of the “expectations filter” during materials analysis.

The Rapid Depositional Model for MSA Change

If, and it seems likely as more and more modern MSA excavations are published, the Klasies sequence represents a fragmentary reflection of the total MSA technological sequence, then some things necessarily follow from that. When thought of in the compressed time-frame suggested here the SAS Member supports a different interpretation of MSA technological variability. The stability within the SAS Member still represents stylistic unity (Wurz 2002, Wurz *et al.* 2003), only for a much briefer period than has been widely assumed.

Interestingly, a rapid depositional time-frame was suggested by Feathers and Bush (2000) for the large MSA deposit at Die Kelders based on luminescence dating. The thick MSA deposit at Die Kelders has periods of relatively little cultural accumulation during which dune sands were deposited in the cave. Those sands were dated by Feathers and Bush (2000) to between 60,000 and 70,000 years ago. This dating estimate corresponds nicely to the dune incursion that truncated the MSA sequence at Blombos Cave (Henshilwood *et al*. 2004). J. F.

Thackeray (2002) concurs that a rapid deposition here is probable, based on little evidence for change in the microfauna. Die Kelders and Klasies have several things in common that make rapid deposition of sediments likely. They are both coastal cave sites. As such they are the focal point of human activities in the setting and attract people repeatedly to the same location. They shelter the archaeological deposits from the elements and these can persist in these locations longer than if they were exposed in the open. Both of these sites have calcrete (limestone) deposits above the caves. These calcretes have acted as buffers against ground water acidity helping to preserve archaeological bone and shell, aiding the rapid accumulation of thick deposits. Coastal caves are also natural traps for dune sands, which also accumulate over relatively brief periods of time adding to the thickness of the deposits.

If we take the view that the deep deposit at Klasies, and in particular the SAS Member is on a time-scale of hundreds, or at the most single digit thousands, of years in duration then the appearance of stasis in the technological sequence there is removed. This appearance of stasis has not only been used to characterize the technological change (or lack thereof) at Klasies, but also for the nature of faunal resource exploitation there (and by extension for *all* of the MSA). In the next chapter the idea that our long held assumptions on the meaning of MSA data may be mistaken is used to quantitatively test the most widely accepted explanation of many of these faunal patterns. The remainder of this dissertation continues in this vein, reassessing our interpretations of the MSA in light of what is rapidly becoming the dominant explanatory framework in MSA research.

Chapter 3: Faunal Resource Use and Behavioral Modernity

The faunal assemblages of the MSA have played a critical role in discussions of the modernity of MSA peoples for some time. One of these discussions was engendered by Binford’s interpretation of the faunal materials from Klasies (Binford 1984). This interpretation focused on the relative abundance of parts of animals and led Binford to propose that the MSA people at Klasies were primarily scavengers and had poor organizational and planning skills. An entire literature has developed in response to this model (Deacon 1985, Klein 1989, Turner 1989, J. F. Thackeray 1990, Milo 1998, Bartram and Marean 1999, Outram 2001). This interpretation has been addressed repeatedly and dismissed on the grounds that the materials that Binford analyzed were absent long bone shaft fragments due to excavation bias (Turner 1989), analytical bias (Bartram and Marean 1999), because and direct evidence for MSA hunting of large bovids has been developed (Milo 1998). However, other patterning in the faunal assemblages of the MSA continues to be used to construct models of human behavior and it is those patterns that I address in this chapter.

In developing explanations for why modern peoples successfully out-competed other hominids, observations on the differences in the faunal assemblages of MSA and LSA sites have often been cited. It is noted that the faunal assemblages have different compositions in taxa present, richness, and size. These differences have been attributed to differing hunting abilities and intellectual capacities for earlier and later anatomically modern peoples in southern Africa. Klein (1994, 1995, 1999, 2000, Klein and Edgar 2002, Klein *et al.* 2004) has repeatedly asserted that MSA hominids were hunters, just less effective at it relative to their LSA successors. This has been used as the most consistent, and most empirically-based, support for the Neural Advance Model of modern human origins.

In this chapter I will argue that these differences, when viewed in the light of sample size and in a framework of foraging theory, are better explained as dietary expansion and the climatic shift at the Pleistocene – Holocene transition. No reference to changes in hunting ability or intellect is necessary, and the use of these comparisons as evidence for non-modern behavior in Middle Stone Age peoples is dismissed. I will provide a hypothesis and some possible models that have the potential to explain those traits without reference to a major change in human intellect.

<u>The Klein Argument</u>

Richard Klein's "Neural Advance Model" (a variant of the Later Upper Pleistocene model) is perhaps the most explicit and detailed statement on the modernity of MSA hominid behavior (Klein 1995, 1999). This model argues that OIS 4 and earlier MSA hominids may have been anatomically modern, but lacked modern intellectual capacity and behavior. He argues that MSA people lacked a variety of key behavioral "markers" and thus were not behaviorally modern. The model suggests that around 40,000-50,000 BP a neural advance occurred as the result of a genetic mutation, to date unrecognizable in skull anatomy, which propelled hominids into a modern intellect. This change in intellectual ability is often coupled theoretically with the attainment of modern linguistic ability. Again, no physical evidence for a change in language exists in the archaeological record for this period of time. The Neural Advance Model has gained widespread acknowledgement largely on the basis of Klein's *Human Career* (1999), considered by most as *the* text on human origins and paleoanthropology and his many repeated statements of this model in numerous publications (Klein 1972, 1974, 1975, 1976, 1979, 1980, 1992, 1994, 1995, 2000, Klein *et al.* 2004). This model, often invoked as explanatory, is widely repeated in other archaeological texts as well (see for example Dillehay 2000) or human evolution texts "…the cultural Great Leap Forward that occurred about 50,000 years ago and during which our modern natures first appeared…" (Ehrlich 2000:164).

The Neural Advance Model has stimulated debate, focusing on the empirical record for the timing and presence of the purported traits of modernity. Recently, McBrearty and Brooks (2000) have argued in a comprehensive review that, in Africa, there is no evidence for a behavioral revolution at 40-50,000 years BP and the expectations for such a revolution are at least partially in the Eurocentric roots of early Upper Pleistocene archaeology. The approach I take in this chapter is slightly different – I will not focus on the empirical record of dates and appearances of traits, but rather the interpretations offered for the meaning of that record, with a focus on the archaeofaunal record of the southern Cape region of South Africa.

The Faunal Pattern

Over the last 30 years Richard Klein has studied a wide range of faunal assemblages from South Africa, both archaeological and paleontological. He has constructed an imposing composite record of faunal patterning that samples both MSA and LSA sites. Klein has identified several interesting patterns in the fauna, and these figure prominently as support for his Neural Advance model.

Buffalo and Eland Mortality

Klein (1999) has argued that MSA sites tend to have greater numbers of eland (*Taurotragus oryx*) relative to cape buffalo (*Syncerus caffer*) and bushpig (*Potamochcerus porcus*), while LSA sites from similar environmental regimes and topographic settings have greater numbers of buffalo and bushpig relative to eland (Figure 3.1). Klein notes that eland tend to be rare in the wild, while buffalo and bushpig are more common, and thus the MSA pattern differs from what one would expect if people were hunting animals based solely on their rate of encounter. Mortality patterns show that most of the buffalo at MSA sites are juveniles while eland show an abundance of prime-age adults (Figure 3.1). The catastrophic mortality profile for eland has been explained by the ease with which entire herds can be driven by people. Klein argues that eland are less dangerous than buffalo and bushpig, concluding that MSA people were forced to focus on the less dangerous but less abundant eland due to an inability to regularly kill the fierce buffalo and bushpig. MSA people occasionally managed to kill buffalo, but they tended to kill juveniles and very aged individuals (Figure 3.1).

Hunting Effectiveness

Klein has identified other faunal patterns that he has linked to the Neural Advance Model. He has argued that LSA people were more effective hunters than MSA people:

> Comparing layers at Nelson Bay formed during the Holocene to ones that appear to have formed during broadly similar portions of the Last Interglacial at Klasies, the Nelson Bay deposits are significantly richer in remains of pigs and poorer in remains of eland...the writer has suggested that the higher frequency of wild pig...reflects the enhanced ability of LSA people to deal with prey that are likely to mount an effective counter-attack on the hunter...the writer has further suggested that even when MSA people hunted basically the same species as their LSA successors, they were less effective, that is, they took a smaller proportion of the available animals. [Klein 1980:262-3]

This concept of foraging effectiveness and its link to faunal patterning as a defining trait of the modern LSA hunter has roots in Klein's earliest writings on the prehistory of southern Africa:

> The fact that the MSA inhabitants of Klasies River Mouth utilized marine resources less intensively and probably less effectively than later Albany and Wilton peoples…raises the possibility that the replacement of the Middle Stone Age was in fact comparable in meaning and importance to the like-aged replacement of the Mousterian in Europe. [Klein 1974:277-278]

This has been repeated in more recent articles as well:

> The enlarged DK1 (Die Kelders) faunal sample augments evidence from KRM that MSA people hunted and gathered less effectively than their LSA successors...[Klein and Cruz-Uribe 1996:331]

And, most recently and clearly:

> One important way that LSA people differed from their predecessors was in their ability to hunt and gather more effectively. This alone could explain how they (or their Upper Paleolithic descendants) managed to spread so quickly and widely…it was the evolution of modern behavior between 50,000 and 40,000 years ago that allowed anatomically modern people to spread from Africa. [Klein and Edgar 2002:239-240]

He uses as support for this increased effectiveness the larger variety of animals exploited by LSA peoples (or taxonomic richness). Klein argues that fish and flying seabirds are rare to absent in MSA sites while they are often abundant in LSA sites. And he argues that this suggests that MSA people had not yet mastered fishing and fowling. The way that he has stated his interpretation of this pattern allows for some of his predictions to be tested using archaeological data. In summary, Klein has repeatedly stated that LSA people, in comparison to preceding MSA people, hunted more animals (number), a wider variety of animals (richness), and some animals were hunted for the first time (diet expansion). Of these parameters, taxonomic richness can be evaluated using the available faunal data.

General Critique

These patterns are based on a set of sites that vary widely in assemblage sizes between the MSA and LSA. The LSA sample that is utilized in this comparison is fairly large and varied, but this is not the case with the MSA. Table 3.1 shows the major MSA sites in South Africa, and identifies those that have faunal assemblages. As one can see, the MSA sample is in fact quite limited. Many South African MSA sites, such as Montagu Cave and Nelson Bay Cave, do not have fauna preserved in their MSA deposits. Thus, the site of Klasies is the only site that provides MSA data on the eland/buffalo issue, while both Die Kelders and Klasies are relevant to the issue of changes in numbers of species across the MSA/LSA boundary.

In addition, considering the MSA and LSA as a dichotomy, rather than as a long sequence, structures the data in ways that emphasize abrupt changes instead of gradual change. This is especially true for the periods of time and region under consideration here. For example, the MSA could be subdivided into three or four periods that would roughly correspond to the duration of the entire LSA. Perhaps even more of a concern is that a substantial gap, of perhaps 20,000 years or more, exists between the MSA and LSA datasets used in formulating the patterns to be explained. This would tend to emphasize further the differences between the two periods, even if the transition had actually been quite gradual in nature. In addressing the taxonomic richness of the faunal assemblages below each excavation unit is considered separately, reducing the dichotomous nature of the comparison.

Sample Size Critique

As noted earlier, Klein has argued that LSA assemblages (among other differences) are taxonomically richer than MSA assemblages. As has been shown by Grayson (1984, 1989) and others (Cannon 2001), in all faunal assemblages there is a relationship between the size of that assemblage and the number of taxa represented. A useful way to compare richness between assemblages of different size is to calculate a regression equation of sample size versus number of taxa for each occupation within a given environmental regime. Changes in slope will represent differing rates at which new taxa are added to the assemblage as sample size increases. A steep slope represents a rapid rate and assemblages in that regression grouping will be richer than those with a more gradual slope but of the same size. Thus our expectation is that LSA assemblages will display a steeper slope than MSA assemblages, if LSA assemblages are richer.

Using Klein's (Klein & Cruz-Uribe 1996) published data on assemblage size for each excavated level at Die Kelders I calculated the regression shown here (Figure 3.2). The strong correlation ($r^2=.8831$, $p<.001$) between sample size and number of taxa for all of the MSA units suggests a close relationship between the number of specimens and the number of taxa present in all of the assemblages.. While the single LSA level at DK1 does show a high degree of richness (the actual number of taxa present), the sample size is also quite large. The regression fit for the MSA passes through the LSA data point – if the LSA was richer, we would expect it to be well above the range of the MSA regression. At Die Kelders there is no statistical difference in faunal richness between the MSA and LSA when sample size is accounted for.

Figure 3.3 shows a similar analysis using the MSA levels at Klasies (KRM) and the LSA levels at Nelson Bay Cave (NBC), the two sites cited most frequently by

Klein in elucidating the faunal patterning and the dichotomy he has selected in describing it. As in the earlier analysis the relationship between the sample size and richness is robust (r^2=.5354, p<.0001 for the LSA and r^2=.8678, p<.0001 for the MSA). Surprisingly, the slope for the MSA is greater than that for the LSA, suggesting that the MSA faunas are in fact richer than the LSA faunas, when sample size is accounted for. This is exactly opposite of what is to be expected if Klein's argument of LSA peoples exploiting a wider variety of animals with ease (hunting effectiveness) is correct.

The LSA data seem to cluster. Using the principles of exploratory data analysis, as espoused by Tukey (1977), these clusters are then investigated to see if they have a temporal component. If we subdivide the LSA sample into pre 10,000 BP and post 10,000 BP, then it becomes apparent that Pleistocene LSA and MSA both have greater slopes and the angles of these are more similar than that for the Holocene LSA (Figure 3.4, r^2=.5892, p<.0001 for the Holocene LSA, r^2=.9420, p<.0001 for the Pleistocene LSA, and r^2=.8305, p<.0001 for the MSA). Thus, the only observable change in assemblage richness occurs not at the MSA-LSA transition, as the Neural Advance Model would suggest, but rather at the Pleistocene-Holocene transition well into the LSA, at least 30,000 years later than *anybody* would argue that behaviorally modern peoples first populated southern Africa. This suggests that on the grossest scale the faunal data do not support a reordered hunting ability at 40-50,000 BP. And it is reasonable to posit that the gross change in the nature of Holocene assemblages is the result of climate-induced reordering of the local fauna, not a reordering of human intellect. Whether there is a similar pattern-shift for the OIS 5/6 transition can not be currently addressed due to lack of data. Interestingly, Klein himself (1974, 1976) noted that the shift in prey species in the Nelson Bay Cave LSA assemblage was climatically-induced and coincided with the onset of the Holocene.

Reinforcing this climate-based, rather than behavioral interpretation is the recent work of Grayson and Delpech (1998) in southwestern France. Species richness in archaeofaunal assemblages follows sample size along climatic regimes, rather than as a behavioral difference between the accumulators, even between *Homo sapiens* and *Homo neanderthalensis*. In fact, using species abundance measures, one cannot distinguish between Cro Magnon and Neandertal accumulated faunal assemblages. This does not bode well for this parameter's usefulness in distinguishing between the foraging abilities of two anatomically modern populations.

Behavioral Ecological Modeling

Thus, with the limited MSA samples, there is no measurable quantitative difference in species richness between MSA and LSA assemblages in South Africa, or that the differences are opposite of what would be expected if later people were more effective hunters. However, there is still the pattern of change at Klasies in the representation of eland relative to buffalo and bushpig. How then to explain this pattern? Behavioral ecology provides a theoretical framework and a set of models that can be applied to archaeological data that I believe can account for many of the differences in assemblage character without invoking changes in cognitive ability or hunting effectiveness.

Behavioral ecology has developed a series of models to explain and examine animal behaviors (Stephens and Krebs 1986, Kaplan and Hill 1992). A subset of these models examines the decision-making rules governing foraging. Foraging theory models have been successfully applied to modern hunter-gatherers (Smith 1991, Winterhalder 1981, O'Connell and Hawkes 1981, O’Connell, *et al.* 1988, 1990, Bird and Bliege-Bird 1997, 2000) and to the faunal (Grayson and Cannon 1999, Grayson and Delpech 1998), botanical (Gremillion 1997, Gardner 1997, Winterhalder and Goland 1997), and, less frequently, the lithic (Kuhn 1995) portions of the archaeological record. These models are robust enough for application to archaeological data because they make qualitative or directional predictions that can be observed in the record. A commonly used model for edible resources is the diet breadth model (or fine-grained prey choice model), derived from the marginal value theorem (see Winterhalder and Goland 1997 for a discussion of the assumptions of this model). This model uses a common currency (often calories) to rank the values of the suite of foods available. Ideally, plants and animals would be considered together. Unfortunately archaeological data do not always support this ideal and one or the other is often considered alone, as is done here.

Faunal resources are often thought of as representing the protein/fat part of the diet and size is taken as a proxy for value. This holds until resources get very large and diminishing returns in handling costs reduce the mean return of that resource (Smith 1991, Broughton 1994a, 1994b). All available prey are then ranked based on the value of that prey in a given currency. The model assumes that highly ranked prey are always taken on encounter. Prey species continue to be added to the diet in descending rank-order until the addition of further prey species begins to reduce the overall mean return rates for the diet. Thus, and somewhat counter-intuitively, low-ranking prey will never be added to the diet even if they are abundant on the landscape unless that ranking is somehow changed or diet is expanded. Low ranking can be the result of potentially dangerous prey being avoided, as I argue for buffalo and bushpig later. The diet breadth is the set of taxa that will be taken in a given set of conditions, including available technology and season.

Diet breadth, as a framework for conceptualizing the record, then actually provides different expectations of how prey species are utilized. For example, sheer abundance on the landscape is not important in ranking resources. Thus, Klein’s note that cape buffalo and bushpig are more abundant on the landscape than eland, and so should be consumed more frequently is not an interpretation that the diet breadth model inherently supports. This model also divides the universe of prey along lines that are often, but not always, taxonomic. For instance gravid females, adult males, and newborns of the same species could all represent different classes of prey. Conversely, several species of similar size and habit could be considered a single prey class. Actualistic studies often can provide refinements to classifications, but many times we must begin with gross generalizations and see what patterns are predicted, and how they relate to available data, and species is often used as a proxy for prey class, as it is here (see Grayson and Delpech 1998 for a more detailed discussion).

A set of inferences drawn from the diet breadth model, the resource depletion or depression model, is designed to make predictions about changes in prey ranking due to predation pressures on that prey (Broughton 1994a, 1994b, Nagaoka 2002, 2005). The resource depletion model applies in instances where a prey species is harvested at a higher rate than can be sustained by reproductive rates or when mobile prey flee the threat of human predation. Jack Broughton (1994a, 1994b) has developed this concept in California for archaeofaunal assemblages and the specific predictions for the changes in prey size, age, and mortality profiles used here follow from that research.

Diet Expansion Hypothesis

The main alternative hypothesis presented here is that the patterning observed in the archaeofaunas of MSA and LSA southern Africa, when viewed in a diet breadth framework, is entirely explainable as an expansion of diet (as proposed by Deacon 1989, outside of the theoretical framework applied here). Figure 3.5 shows the main South African terrestrial prey ranked by body size. Any expansion of diet breadth to lower return species is often referred to as intensification, as the predator is now working harder for the same return. In reality, and particularly in Africa, the relation between body size and post-encounter return rate is somewhat more complicated due to the diversity of predator avoidance tactics. There are species of similar size, such as eland and buffalo that have very different predator avoidance tactics. In this case buffalo fights, and eland flees. Thus with buffalo, and bushpig as well, the potential risk (in both the senses, uncertainty and physical danger) adds a great deal of cost to that prey item, lowering its overall ranking. Diet breadth models can account for different classes of behavior by prey by considering each behavioral class separately or by adjusting their relative rank. Since the type of risk is catastrophic (severe injury or death) it may be reasonable to place them below all non-dangerous prey types, as they are in this re-ranking (Figure 3.6).

The diet breadth model makes several important predictions that are relevant here. Lower ranked prey should not be added to the diet unless the returns from higher ranked prey begin to fall. Thus, the addition of fish, birds, buffalo, and bushpig in the LSA could have occurred simply as a result of diminishing returns from higher-ranked prey, like eland. Diminishing returns generally result from increasing search costs and/or lowered encounter rates. Thus, the diet breadth interpretation of the patterns Klein has recognized is that the change from MSA to LSA represents an expansion of diet breadth, an intensification of labor and concomitant reduction in foraging efficiency.

Resource Depletion Model

A variation of the alternative hypothesis is that the changes reflected in the South African faunal assemblages are the result of resource depletion caused by human predation. This model argues that as a result of over-hunting, increased human population densities, or a combination of both the numbers of large, highly-ranked prey animals were greatly reduced resulting in an increased reliance on lower-ranked prey and the addition of previously avoided prey species to the diet.

This model makes several predictions (from Broughton 1994a, 1994b):

1) highly-ranked resources will account for a higher proportion of the mammalian faunal assemblage during the MSA than during the LSA;

2) the MSA-LSA transition should be gradual, with reductions of highly-ranked resources beginning during the MSA;

3) as exploitation intensifies the size and ages of individuals within taxa will also be reduced; and

4) as highly-ranked prey are depleted, difficult to capture prey with lower return rates will enter the faunal record for the first time.

Each of these predictions is potentially observable in the archaeological record. Figure 3.7 shows the Die Kelders bovids classified into size groups and arranged by layer, for the largest assemblages. These are fragmentary remains that could not be assigned to a taxon. Fortunately, the models being applied here use size as a proxy for value and this information is quite useful. The data show a clear trend for a reduction in proportional representation of large animals over time. The data on shellfish and tortoise predation for the MSA and LSA from the Cape are also consistent with this model.

Figure 3.8 compares limpet (*Patella*) shell size between the LSA layers at Paternoster and Elands Bay, bars in gray, relative to several MSA sites, with bars in black. The limpets from the LSA sites are significantly smaller. Modern samples from the same region are larger than either the LSA or MSA samples. A similar pattern was found at Klasies River Mouth, where it was found that MSA *Turbo samarticus* and *Perna perna* were both larger in the MSA than in the LSA. Bird and Bliege-Bird (1997, 2000) have shown in ethnographic contexts that shellfish offer a near ideal demonstration of depletion in that they are frequently considered low-ranked as a class, size and age can correlate closely, and size can easily be selected during capture. Thus, limited reliance on shellfish will result in large individuals in the diet whereas intensification of shellfish resources will result in increasingly smaller individuals (and diminished returns) in the diet.

Environmental Change

An expansion of diet could also result from changes in the local environment, with no necessary changes in human behavior, as was evident in the richness analyses of the Pleistocene-Holocene transition. The prey populations in a reordered biota would still only be expected to exhibit depressed mortality profiles when under predation pressure, thus the size changes evident in prey species during the South African Stone Age are not adequately explained by environmental change alone.

Environmental change can, however, be invoked in explanation of the changes in species representation in the faunal assemblages. Klein is explicit in stating that the local settings are the same for the LSA and MSA, and this assumption is required for direct comparisons of the type that he has made to be meaningful. As I have demonstrated most of the patterning that he has observed is in fact a comparison of Holocene and Upper Pleistocene fauna. In the settings of the sites where the assemblages were accumulated, Klasies and Nelson Bay Cave, local settings would be greatly influenced by changes in sea level and the concomitant expansion and retraction of currently submerged coastal plains. During times of lowered sea levels (nearly all of the period of MSA occupation) a coastal grassy plain of up to 15 km width would have been situated adjacent to the sites. During times of modern sea levels (nearly all of the period of LSA occupation) these plains would have been submerged and the near shore environment dominated by brushy shrubs. Eland are more abundant in open settings and buffalo and bushpig are more abundant in brushy settings. As discussed at the beginning of this chapter Klein's analysis is dependent on prey abundances remaining constant for these two species through time. This makes Klein's assumptions about abundances doubly problematic.

Discussion and Conclusions

The hypothesis proposed here (diet expansion) requires that foraging returns were gradually decreasing across the MSA and LSA boundaries, and that people intensified their foraging strategies in response. As discussed above, the evidence to date suggests that MSA people harvested small-bodied prey less intensively than LSA people, and this is consistent with changes in prey ranking.

To summarize, no statistical evidence for a change in species richness across the MSA-LSA boundary was found. A hypothesis was proposed (diet expansion), and the diet breadth and resource depletion models applied, as an alternative to the Neural Advance Model for changes in faunal patterning across the MSA-LSA boundary. The behavioral ecological and demographic models proposed here are compelling for several reasons.

First, they do not demand an appeal to a neural advance that, so far, is untestable in the fossil record. Along these same lines, it is important to note that similar changes in faunal representation are seen elsewhere in the world during periods when modern people are undoubtedly present, and neural advances are not advocated for these changes (Broughton 1994a, 1994b, Stiner *et al*. 1999, Nagaoka 2002, 2005).

Second, these models are more consistent with the slow and incremental addition of fishing and fowling in the record. Had fowling and fishing been constrained solely by a lack of technological ability, the removal of that constraint should appear to be abrupt. The evidence for very sophisticated technology in the MSA has increased greatly in the past few years (Brooks *et al*. 1995, Yellen *et al*. 1995, Henshilwood and Sealy 1997, Henshilwood *et al*. 1999, d'Errico *et al*. 2001, Soressi and Henshilwood 2004). Again, any appearance of abruptness in change in archaeofauna of the Cape is likely greatly magnified, if not solely the product of, the current 20,000 year gap in the archaeological data.

Third, these models are more consistent with the increasing use through time of labor intensive tools made on bone, ground stone, and composite tools and beginning well before the proposed 50,000 year old boundary. Manufacturing these tools would increase handling costs across the board, something that would only be expected during periods of intensification. Climatic change was especially abrupt along the Cape Coast at about the same time as the Howiesons

Poort sub-stage at the onset of OIS 4 (Table 1.1). This period of time is marked by the earliest clearly composite tools in the archaeological record.

Fourth, the behavioral ecological models applied to the problem of MSA faunal resource used here are grounded in ecological theory. As such they are not uniquely human-oriented and are based on a vast body of direct observations. Conversely, interpretations that rely on some uniquely modern thought process development that was not, and cannot be, directly observed will always require some leap of faith or special pleading. Obviously, at some point (or several points) in human history cognitive developments gave our ancestors adaptive advantages over other animals on the African landscape. Invoking a major cognitive development makes little sense when the archaeological evidence suggests gradual technological developments that are poorly matched to the proposed time-frame and completely unmatched to the biological evidence. It is increasingly clear that the MSA is much more technologically and behaviorally diverse than previously thought. Only in the context of trying to match the technology of the MSA to the Middle Paleolithic of Europe, is a global cognitive development at 50,000 BP required.

And fifth, these models can be investigated and falsified by existing or foreseeable archaeological data. It is possible that the predictions of the models applied here may be investigated in the future, using more refined and sophisticated ecological data (for example, a climate and species specific study of the shellfish data, taking into account changing beaches and offshore currents) and found to represent something besides predatory pressure. In contrast, the Neural Advance Model is increasingly at odds with new archaeological discoveries and its predictions are not even met with the data used to develop it.

If behavioral ecological models explain the patterns of faunal exploitation in the South African Stone Age, then the "markers" of modern human behavior selected by Klein and others are actually the result of a continuation of existing (and modern) behaviors and patterns in increasingly depleted or restricted environments. Indeed, continuing to invoke faunal assemblages as the basis for interpreting technological (and underlying cognitive) ability strains credulity when archaeological assemblages that speak directly to these issues suggest much deeper time-depth for sophisticated technological and symbolic behaviors. When sample size and global climate are accounted for, there is no support, in the relevant archaeofauna, for a reordering of human cognition in the time range required by Klein’s Neural Advance/Hunting Effectiveness variant of the Later Upper Pleistocene model.

Table 3.1: South African MSA sites, and the presence or absence of relevant fauna.

Site	Fauna Preserved?	Fauna Published?
Klasies River[1]	Yes – but biased	Yes
Die Kelders Cave 1[2]	Yes	Yes
Blombos[3]	Yes	No
Pinnacle Point Cave 13B[4]	Yes	No
Boomplaas[5]	Yes – but too small	Preliminary
Peers Cave[6, 8]	Yes – but biased	No
Diepkloof[7]	Yes	No
Nelson Bay Cave[8]	No	NA
Elands Bay Cave[9]	No	NA
Montague Cave[10]	No	NA
Hollow Rock Shelter[11]	No	NA
Howieson's Poort Shelter[12]	No	NA
Dale Rose Parlour[13]	No	NA
Tunnel Cave[14]	No	NA

1. Singer and Wymer (1982), Deacon and Geleijnse (1988)
2. Marean *et al*. (2000)
3. Henshilwood and Sealy (1997), Henshilwood *et al.* (2001a, 2001b, 2003, 2004), analysis in progress
4. Marean *et al.* (2004), analysis on progress
5. Deacon (1979)
6. Goodwin (1949)
7. analysis in progress
8. Volman (1981)
9. Parkington (1987)
10. Keller (1973)
11. U. Evans (1994)
12. J. Deacon (1995), Stapleton and Hewitt (1927, 1928)
13. Schirmer (1975)
14. B. D. Malan (1955)

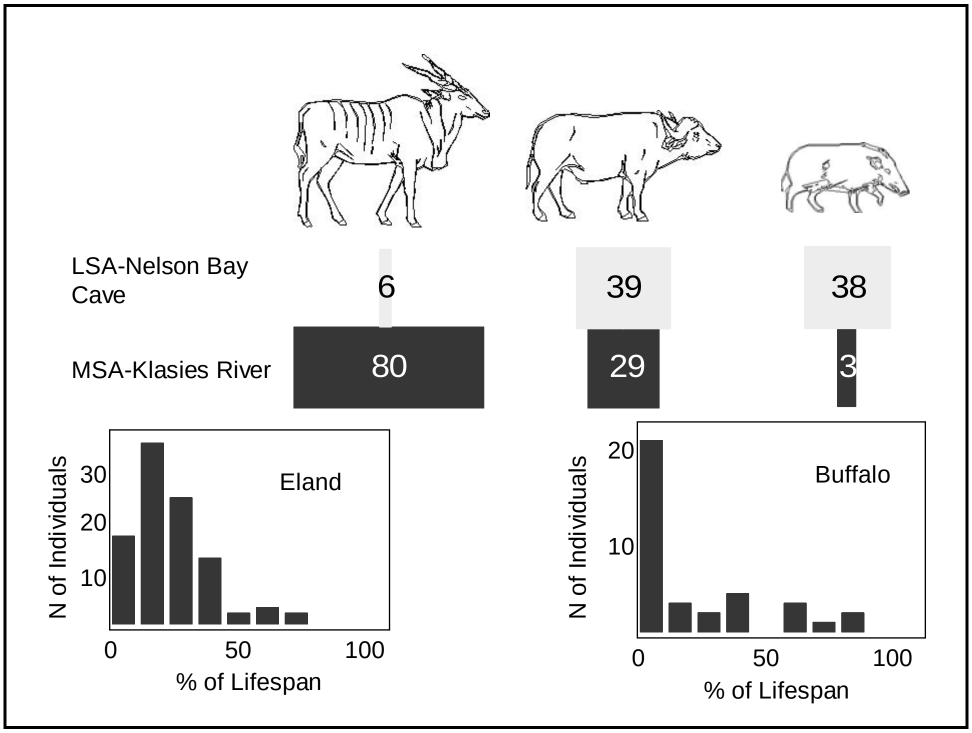

Figure 3.1: Relative abundances and mortality profiles of cape buffalo, bushpig, and eland from Cape MSA and LSA sites.

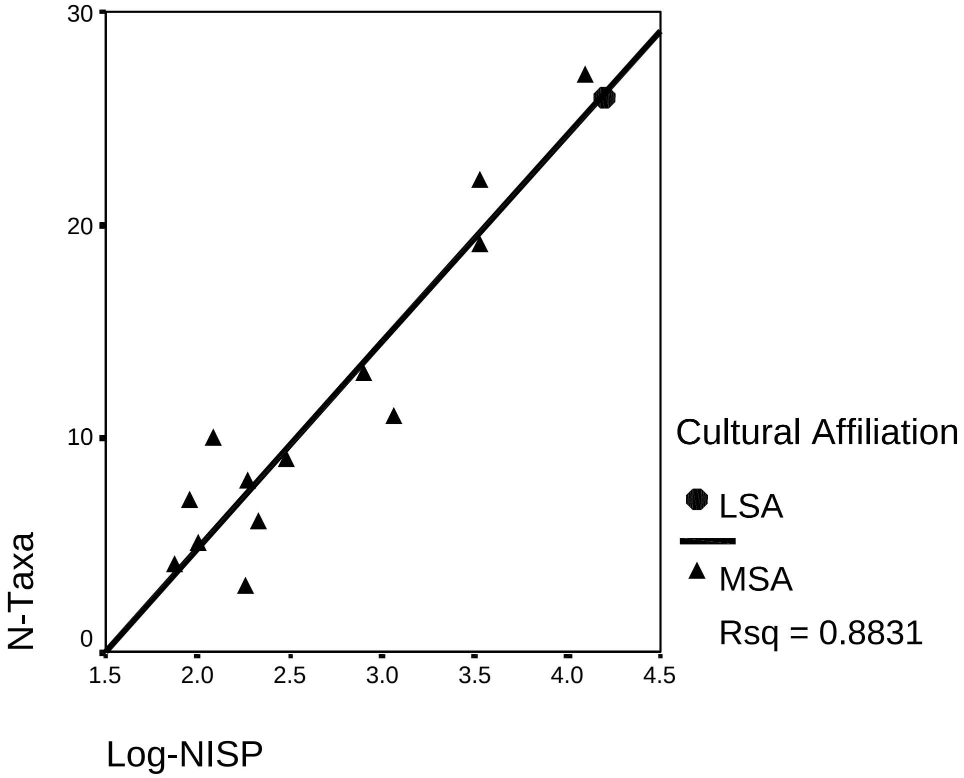

Figure 3.2: Regression slope of number of taxa versus sample size for all MSA layers and for the single LSA layer at Die Kelders.

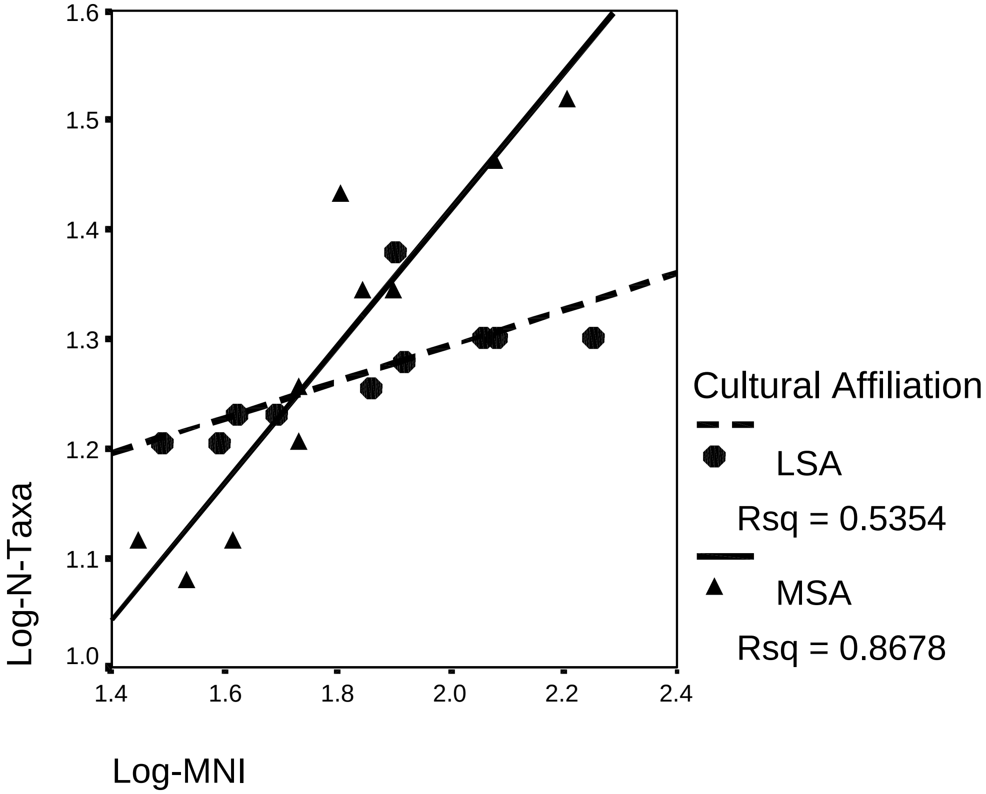

Figure 3.3: Regression slopes of number of taxa versus sample size for MSA layers at Klasies and LSA layers at Nelson Bay Cave.

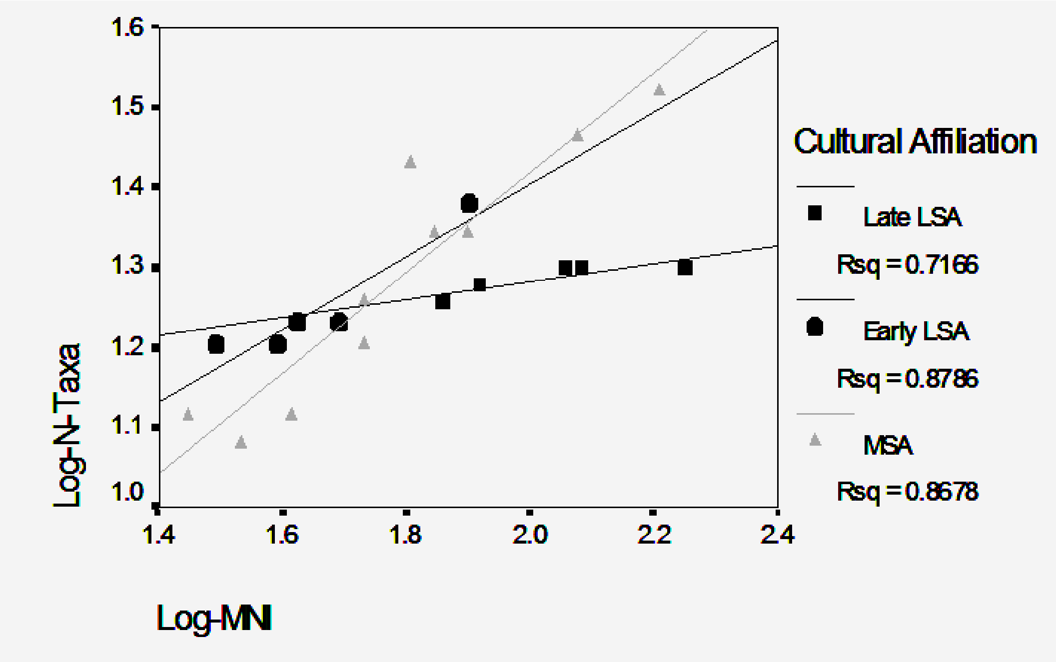

Figure 3.4: Regression slopes for number of taxa versus sample size as in Figure 2.4. The LSA layers have been subdivided into Pleistocene-aged and Holocene-aged LSA.

1. Elephant
2. Hippo
3. Rhino
4. Giant Buffalo
5. Buffalo
6. Eland
7. Kudu
8. Wildebeest
9. Quagga
10. Blue Antelope
11. Red Hartebeest
12. Bushpig
13. Bontebok
14. Warthog
15. Southern Reedbuck
16. Vaalribbok
17. Bushbuck
18. Springbok
19. Mountain Reedbuck
20. Oribi
21. Steenbok
22. Grysbok

Figure 3.5: Ranking of Cape terrestrial prey species based on body size.

1. Eland
2. Kudu
3. Wildebeest
4. Quagga
5. Blue Antelope
6. Red Hartebeest
7. Bontebok
8. Warthog
9. Southern Reedbuck
10. Vaalribbok
11. Bushbuck
12. Springbok
13. Mountain Reedbuck
14. Oribi
15. Steenbok
16. Grysbok
17. ***Elephant***
18. ***Hippo***
19. ***Rhino***
20. ***Giant Buffalo***
21. ***Buffalo***
22. ***Bushpig***

Figure 3.6: Re-ranking of Cape terrestrial prey species with dangerous species moved to the bottom of the ranking (***italics***).

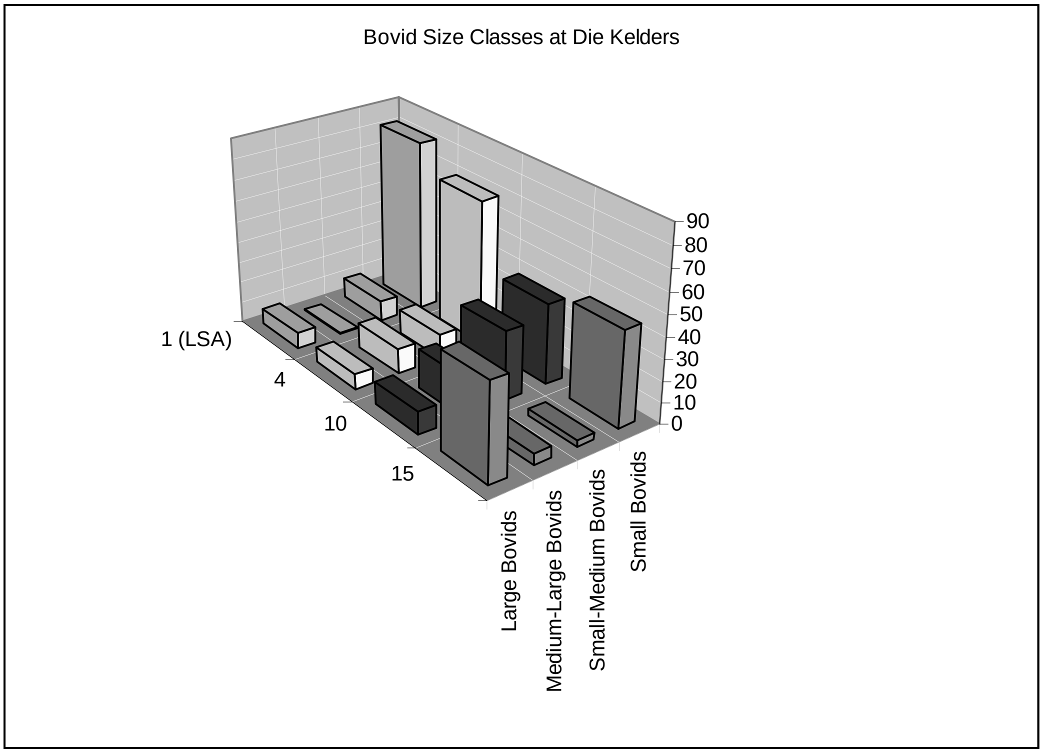

Figure 3.7: Change in relative abundance in bovid size classes through time at Die Kelders (data from Klein and Cruz-Uribe 1996).

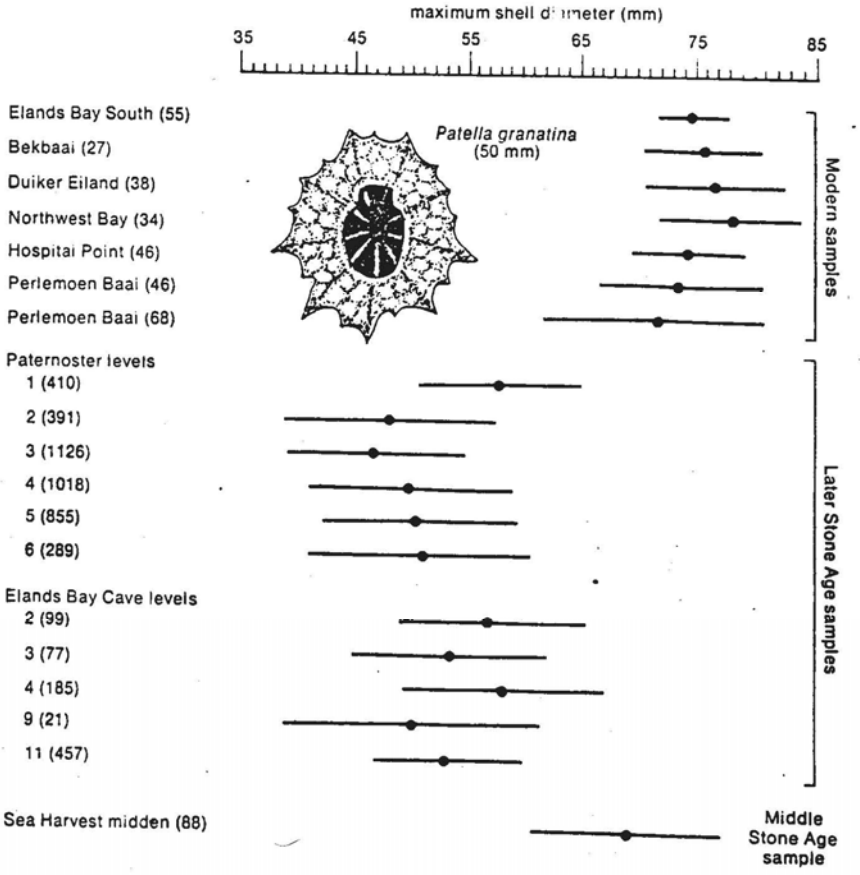

Figure 3.8: Change in size for limpets (*Patella patella*) through time at Paternoster Cave and Elands Bay (after Grine *et al*. 1991).

Chapter 4: Lithic Foraging Strategies

Behavioral Ecology and Lithic Resource Use

The way that people forage their landscapes for resources can be modeled and investigated in a number of ways. In the previous chapter I provided examples of how one of these approaches, behavioral ecology, has been applied to the edible parts of the archaeological record. This approach can be used to investigate other aspects of past human behavior. In an important early attempt to apply behavioral ecological modeling to lithic resource use and the archaeological record, Ambrose and Lorenz (1990) investigated the problem of the Howiesons Poort sub-stage[1] in the southern African MSA. In that paper Ambrose and Lorenz compared general mobility patterns (based on lithic raw material occurrences) to the general environmental setting to reach the conclusion that MSA people behaved in a way that was different from any modern peoples, either ethnographically or archaeologically observed. At the time of its writing this was used to support the idea that MSA people, during the period of time prior to that the Howiesons Poort represents, were not behaving in a fully modern fashion.

More recently Ambrose (2002) has revisited the use of raw materials in the HP. Although no longer positing “non-modern” behavior, this more recent paper continues to try and explain a pattern (increase in fine-grained raw material use) by invoking distant sources for these materials. As Ambrose and Lorenz (1990) is one of only two explicit published models (for the other see Deacon and Deacon 1999, Deacon and Wurz 1996, Wurz 1997, 1999, 2000) that attempts to explain the Howiesons Poort pattern, one of its basic underlying premises is examined further here.

The assertion that MSA peoples at the onset of the Howiesons Poort were not behaving in ways analogous to modern peoples has special importance in the debate over modern human origins. Several models have been proposed for the timing and nature of this event (Henshilwood and Marean 2003, McBrearty and Brooks 2000). In only one of these proposed models, the Later Upper Pleistocene Model or the Neural Advance Model (Klein 1995, 2001), do modern behaviors arise after the Howiesons Poort and Ambrose and Lorenz (1990) is one of the few empirically based studies that supports that model.

The Howiesons Poort Sub-stage

As originally defined by Stapleton and Hewitt (1928, 1929) at the name site, the Howieson's Poort shelter near Grahamstown, South Africa, the Howiesons Poort was a "lithic industry" of the MSA. J. Deacon (1995) provides a discussion of the history of excavation at that site and numerous artifact illustrations. Thackeray (1992) has provided an overview of Howiesons Poort occurrences and its stratigraphic location within the MSA. She demonstrated that the Howiesons Poort occurs within the MSA sequence and is not a transitional entity between the

MSA and the Later Stone Age (LSA) as was once thought (e.g. Clark 1959). A major Howiesons Poort horizon was identified at the Klasies River cave sites by John Wymer in the 1960s and it is that published assemblage (Singer and Wymer 1982) that is utilized by Ambrose and Lorenz (1990) to explore raw material patterning during this industry. The lithic assemblages from more recent excavations at the Klasies River main site by Hilary J. Deacon's team from Stellenbosch University have been presented by Wurz (1997, 1999, 2000, 2002, Wurz *et al*. 2003).

That the Howiesons Poort has been the focus of much research is not surprising. Technologically and typologically the stone tools of the Howiesons Poort contain many elements that are rare or absent in preceding MSA assemblages. These include small blades that grade into bladelets and most markedly backed pieces. These backed pieces are often larger than those of the LSA, but somewhat smaller than the typical flake and blade tools more common in the MSA (hence the original supposition that they were intermediate between the two). Howiesons Poort knappers had an obvious preference for finer-grained raw materials, like quartz and silcrete, for manufacturing both the small blades and bladelets and the backed pieces typical of that industry. It should be noted that this preference was not exclusive at Klasies River where the majority of tools continued to be made on quartzites during the Howiesons Poort (Singer and Wymer 1982). This is also the case for the nearby large Howiesons Poort component at Nelson Bay Cave

(Volman 1981). Howiesons Poort sites also show an increase in the abundance and variety of ochres used for pigments when compared to prior MSA sub-stages and this is interpreted as increasingly complex symbolic behavior (Watts 1997, 2002). Dating for the Howiesons Poort has consistently placed it at around 60,000 years ago (Feathers 2002, Tribolo 2003) or OIS 4, a time of increased aridity and lowered sea levels in southern Africa.

Exotic not Non-Local

Singer and Wymer (1982) used two terms to describe the fine-grained lithic raw materials that increased in frequency of use during the Howiesons Poort, "exotic" and "non-local". These terms were used interchangeably by both Singer and Wymer (1982) and then later by Ambrose and Lorenz (1990), when in fact they can mean two very different things. Non-local means that the raw material occurs naturally at some distance from the site, typically >25 or 50 km, and its presence is used to indicate foraging range, special procurement journeys, or long-distance trade[2]. Exotic is an informal term that means the raw material is rare, may be from some distance away, and its source may be unknown. Singer and Wymer did not know the sources for any of the raw materials that they termed "non-local", speculated that they may have had origins in nearby river valleys, and made only a "cursory" attempt at locating them in the vicinity of the caves (1982:89). No formal raw material survey has been undertaken in the vicinity of the Klasies River sites.

Additionally, van Andel (1989) notes that the offshore bedrock geology in the Klasies vicinity could contain many of the fine-grained materials used during the MSA and these would have been exposed during lower sea stands, such as during the Howiesons Poort, and also possibly weathered into beach cobbles (Figure 4.1). At a very similar geologic setting on the Cape coast, at Pinnacle Point near Mossel Bay, an on-going archaeological program has begun to address these issues (Brown n.d., Marean and Nilssen 2001, Marean *et al*. 2004). While still in a very early stage a raw material survey in the vicinity of Pinnacle Point has identified quartzite cobbles and bedrock, quartz seams and cobbles, silcrete in primary geological context and as cobbles in streams and conglomerates, and various cobbles of hornfels, chert, and chalcedony within a 15 km radius of the MSA cave sites

Silcrete cores from the Howiesons Poort component at Klasies were frequently clearly made on stream or beach cobbles (Wurz, personal communication; personal observation of the author, Figure 4.2). Noting that the “non-local” rock occurred in small cobble form Singer and Wymer go on to observe that “…the knapping of the pebbles of the finer-grained rock appears to have been done entirely on the living sites, as outer flakes of these rocks are commonly found” (1982:90). Silcrete cores from Blombos Cave, from the Still Bay layers, another silcrete-rich sub-stage of the MSA, are also frequently in the form of water-worn cobbles (Soressi and Henshilwood 2004). At least one example from Blombos is encrusted with marine barnacles on the cortical surface, suggesting that it was recovered from a cobble beach during a sea-level retreat (Soressi, personal communication).

Roberts (2003) has recently mapped the occurrence of silcrete in primary geologic context in the southern Cape. Silcretes occur in a near continuous belt across the Cape Fold Mountains, including inland from the Klasies River main site (Figure 4.3). Anywhere that this belt is dissected by streams or rivers the occurrence of silcrete in alluvial gravels is to be expected. Additionally, alluvial gravels containing whatever materials were locally present are incorporated into the Pleistocene-aged Klein Brak Formation along much of the southern Cape (Malan 1991). This conglomerate formation was deposited during the IOS 5e high stand and dates to about 125,000 years ago. Locally the Klein Brak conglomerate is eroded into streams to again become alluvial gravel (Figure 4.4). Quartz, the second most common material labeled as “non-local” by Ambrose and Lorenz (1991), occurs as seams and cobble inclusions within the Table Mountain Sandstone quartzite that is the parent material of the Klasies River caves (Figure 4.5). The observations of all of the researchers working with these assemblages, including Singer and Wymer, are clear; the fine-grained raw materials are originating as water-worn cobbles *and* they are being transported to the sites in cobble form. The latter part of this observation is of no small importance. The presence of cobble cortex and primary reduction of cores suggest minimal transport distances for these materials.

Further evidence to support the local nature of the fine-grained raw materials comes from the variability between Howiesons Poort assemblages. As I have noted the main local sources of fine-grained raw materials in the vicinity of Klasies River and Nelson Bay Cave are in the form of secondary water-borne deposits. At these sites the percentages of Howiesons Poort tools made on fine-grained raw materials, while substantially higher than for other MSA sub-stages, still never exceeds half. In contrast, the Howiesons Poort tools at Montagu Cave, further west, are made almost exclusively on silcrete, which is locally abundant in primary geological formations (Keller 1973, Volman 1981). Roberts (2003) has mapped especially abundant and dense surface occurrences of silcrete around Grahamstown, the location of the Howieson's Poort shelter and the Howiesons Poort tools from that site are similarly made almost exclusively on silcrete (Stapleton and Hewitt 1928, 1929, J. Deacon 1995). While the early excavators of the Howieson's Poort shelter selected which artifacts to keep in a biased way it is likely that any formally retouched tool was kept regardless of its raw material, making the use of that data valid in this context.

Resource and Technological Intensification

In order to extract more resources from the local environment, a process that archaeologists often refer to as intensification, foragers can expend additional energy in different ways to accomplish similar goals. It is important to note that all forms of intensification are inherently inefficient. Extracting additional prey from the local environment by expanding the regular diet to include increasingly small packages is resource intensification. Another version of resource intensification is the increasing inefficient extraction of calories from normal prey, such as smashing and boiling the bones of an antelope, increasing handling costs. Increasing the costs of tools in order to mitigate capture and or handling costs I refer to as technological intensification (Minichillo 1999).

Technological intensification can involve increased costs in procuring raw materials for tools or in their manufacture. The Howiesons Poort appears to be an example of both, with increased cost for stone as well as for the construction of the complex composite tools of which the small blades and backed pieces are the preserved parts. In each case intensification can be measured in travel distance, energy output, or time. I argue here that time is the best currency for modeling technological intensification during the Howiesons Poort.

Time versus Distance

The lithic portion of the archaeological record has several characteristics that make it well-suited to economic-based foraging models. These characteristics include static locations of resources, gradual depletion of resources with no rebound over time (i.e. rocks do not "grow" back if left alone, although new exposures can appear similar to rebound), physical characteristics that can be measured in the present and compared to make ordinal scale rankings, in many cases knowable sources for individual specimens, near universal use by prehistoric peoples, and, in comparison to other artifact classes, much greater preservation in the archaeological record.

The positive aspects of these characteristics have long been recognized in archaeology and have been used to generate models of mobility and exchange (i.e. Binford's logistic foraging). While these models do not rely on foraging theory formally many of them have aspects of central place models, with decisions on when to process in the field and when to transport whole raw materials based on distance to source measures. These types of models, however, can usually only be applied to lithic resources that occur as primary sources.

The aspects of the lithic record that are most problematic for modeling using foraging theory are threefold. Firstly, there is no set currency for the "value" of a lithic resource. That is, unlike edible resources there is no caloric or other fitnessenhancing measure that can be easily approximated in most cases. For example, the use of body size as a proxy for prey rank in faunal resources has wide application and a sound theoretical basis. No formal proxy measure of value has been theoretically developed for lithic resources. Secondly, and closely related to the first point, there is little theoretical basis linking changes in lithic resource use to changes in subsistence and ultimately fitness. An exception to this in foraging theory is found in diet choice models, which must take into account how changes in technology (including lithic technology) affect capture and processing rates, but this is done largely by attempting to hold technology constant (Winterhalder and Goland 1997). And, thirdly, the aspect of the lithic record that I will address most directly in this paper, is the fact that the majority of the lithic record, in many settings, is produced from locally available or secondarily deposited raw materials. These types of materials are usually not subject to the sourcing methods applicable to primary source materials. For example, a specific type of chert in glacial till, while it can be accurately petrographically or chemically characterized, may occur over several thousand square miles. What part of its range it was collected from remains unknown. In addition, transport costs are likely not to be significant in resource choice for locally available materials, so central place models tell us little about what costs are involved for different materials.

As I have noted earlier primary lithic resources are often modeled as being travel-time dependent (distance as currency) and have been used frequently to make arguments for foraging range (Binford 1980), group mobility (Tankersley 1991, Ambrose and Lorenz 1990, Kelly 1988), and long distance trade. Another type of lithic resource distribution has a different set of characteristics that require a different type of modeling. This type of resource often occurs as a secondary deposit covering a wide area on a local or regional scale and is internally heterogeneous. Secondary resources are common in many settings such as stream and river cobbles, beach cobbles, and aggregate in glacial outwash and till. As these deposits are secondary, sourcing methods fail to pin-point the location at which they were collected. They can be in the form of small percentage of chert or flint cobbles in a field of quartzite, or as cobbles of the same general material class having a finer grain or other desirable characteristic than the rest of that class (for example some finer-grained quartzite cobbles in a field of quartzite cobbles). As the occurrence of some of the classes of materials in this type of deposit may be very low it would not be unusual for them to be labeled as “exotics” or even as “non-local” when analyzed in the lab by archaeologists. When the source of these materials is correctly identified as being from local deposits of this type a common practice is to treat them as very low cost, due to a nearest distance-traveled determination. I argue in this paper that the nature of this type of resource makes them dependent on search-time (time as currency) rather than on distance-traveled measures (distance as currency) and therefore a different type of model from a central place one is required.

The diet breadth (or resource choice) model has many elements that make it attractive for use with local and secondary lithic resources. Rather than review all of the assumptions of this model, which have been well-described elsewhere (see Winterhalder and Goland 1997:128-134), I want to focus on those aspects of this model that apply especially to lithic resources. 1) The resource choice model holds that there is a fine grained random distribution of resources in the local environment (Winterhalder and Goland 1997). This is true perhaps more so for piles of beach or stream cobble or rocks in glacial till than for any edible resource. 2) Encounter rates are held to be a product of resource density with search time being separate from processing and handling costs. For many lithic resources occurring as cobbles handling and processing costs can be considered nearly equal, leaving search time as the main cost of capture.

Applying a diet breadth model to the lithic raw materials at Klasies River and other Howiesons Poort occurrences shows a reordering in the ranking applied to them, with the fine-grained materials, primarily silcrete, becoming very highly ranked and for the first time exceeding their local representation in the lithic assemblages. Rather than a by-product of increased foraging ranges this can be explained fully in the local geological context as increased foraging times. Why this was done is not fully resolved but in the context of foraging theory a shift in technology can occur in order to keep the diet the same. There is some evidence to support this interpretation as the Howiesons Poort is dated to a time of increased aridity and probably declining local prey productivity yet there is no evidence for a change in prey species in the faunal record from this time (Klein 1972, 1975). This interpretation has the added benefit of also explaining why the Howiesons Poort went away. When the local climatic conditions improved in the second half of OIS 4 the costs of technologies based on increased foraging times outweighed their benefits and they were discontinued.

Summary and Conclusions

Foraging models with time as the currency offer a better explanation of the presence of larger quantities of fine-grained raw materials during the Howiesons Poort than increased residential mobility. All of the fine-grained raw materials probably originated from secondary deposits in the local setting of the Klasies River main site. This means that the basic premise for the interpretation of mobility and setting used in Ambrose and Lorenz (1990) is in error. The interpretation of Ambrose and Lorenz (1990), that the peoples of the Howiesons Poort employed a foraging strategy that involved a large range and high mobility, relative to prior and subsequent MSA sub-stages, is not supported and the null hypothesis that the purported shift in mobility is somehow “non-modern” can be rejected. Consequently the patterns of raw material use during the Howiesons

Poort sub-stage can no longer be used to support the Later Upper Pleistocene Model for modern human origins.

However, change to a time as currency model from a distance as currency model has little or no effect on Deacon and Wurz's model of reciprocal exchange as a risk-reducing strategy. Increasing the value of artifacts by long-distance transport or by extended foraging times are both compatible with this model. As secondary deposits are, by definition, removed from easily knowable primary sources the movement of finished Howiesons Poort pieces between groups in the Cape of southern Africa may be impossible to detect in the archaeological record by raw material alone and additional technological or stylistic analyses may be required.

This does not mean that the movement of raw materials over long distances is unknown is the African MSA. The movement of well-sourced obsidians over >100 km in East Africa is well-documented (McBrearty 1981, 1986, 1988, Mehlman 1977, 1979, 1989, 1991, Ambrose 2001, 2002). This mosaic of approaches, of long distance travel and exchange and of local intensification, is the general pattern of at least the second half of the MSA. It is this *pattern*, not any one resource procurement strategy, which is fully modern.

1 I am following Wurz (2002) in the use of technologically defined and temporally discrete sub-stages for the southern African MSA. This causes some spelling oddities in this dissertation as Howiesons Poort is given without an apostrophe in that nomenclature, but the site itself was always spelled with an apostrophe by the researchers working there (Stapleton and Hewitt 1928, 1929, J. Deacon 1995). I utilize both here, accepting the modern spelling for the sub-stage and using Howieson's Poort shelter to refer specifically to the original site near Grahamstown.

2 For example, Gould (1977) used "exotic" for raw material sources >40 km away and Roth (2000) termed raw materials from >100 km "nonlocal." Kuhn (1995) noted that what archaeologists consider "local" is variable. "There is little consensus regarding the significance of the distances stone tools found in archaeological contexts were moved" (Kuhn, 1995:27). Blades (1999) suggested that what is meant by "local" should be determined for each archaeological case and determined a distance of >25 km as "nonlocal" for his study. Other analysts forgo the use of these terms entirely and create "natural classes" for each site analyzed (Feblot-Augustins, 1990). Singer & Wymer recognized the inaccuracy of their use of the term "nonlocal" and stated such (1982:75).

Figure 4.1: Cobble beach typical of those along the Cape coast, Pinnacle Point, South Africa, P. Karkanas for scale.

Figure 4.2: Silcrete artifacts from the Howiesons Poort levels at Klasies, all exhibiting water-worn pebble cortex. White bar is 1 cm.

Figure 4.3: Conglomerate of the Klein Brak Formation eroding back into alluvial gravel, Klein Brak River, South Africa. Walking stick is approximately one meter.

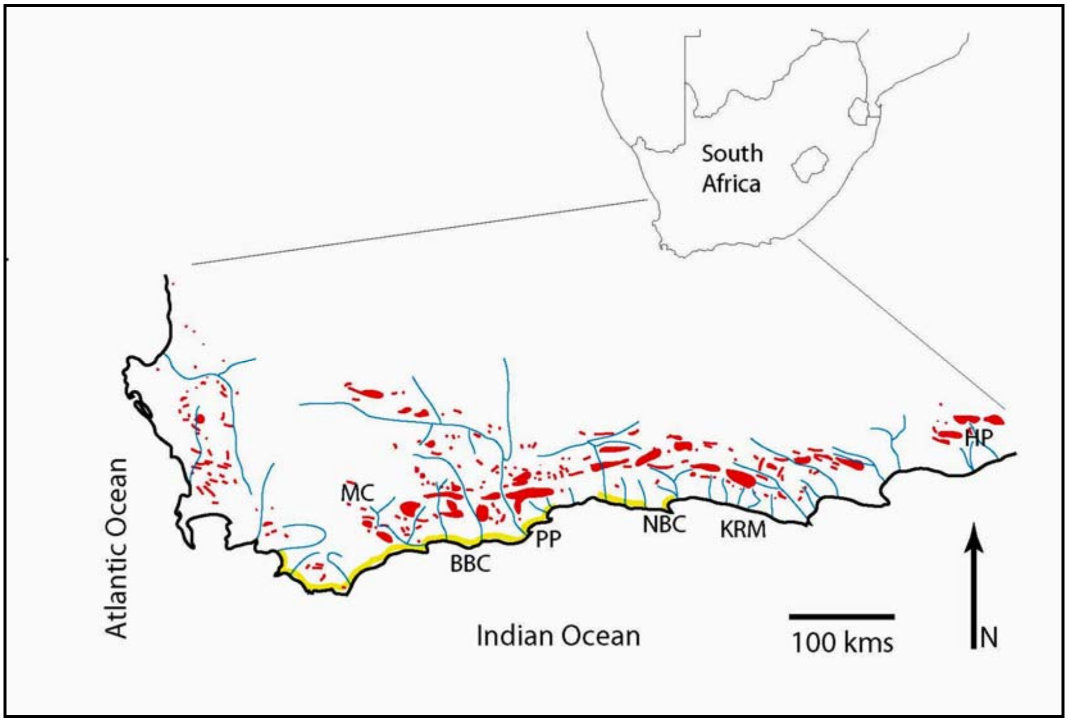

Figure 4.4: Map of the southern Cape showing sites discussed in this chapter, Montagu Cave (MC), Blombos Cave (BBC), Pinnacle Point (PP), Nelson Bay Cave (NBC), Klasies River main site (KRM), and Howieson's Poort shelter (HP); locations of primary silcrete (red); the coastal distribution of the Klein Brak Formation conglomerate-containing Bredasdorp Group (yellow); and major streams that dissect them (blue); adapted from Malan (1991) and Roberts (2003).

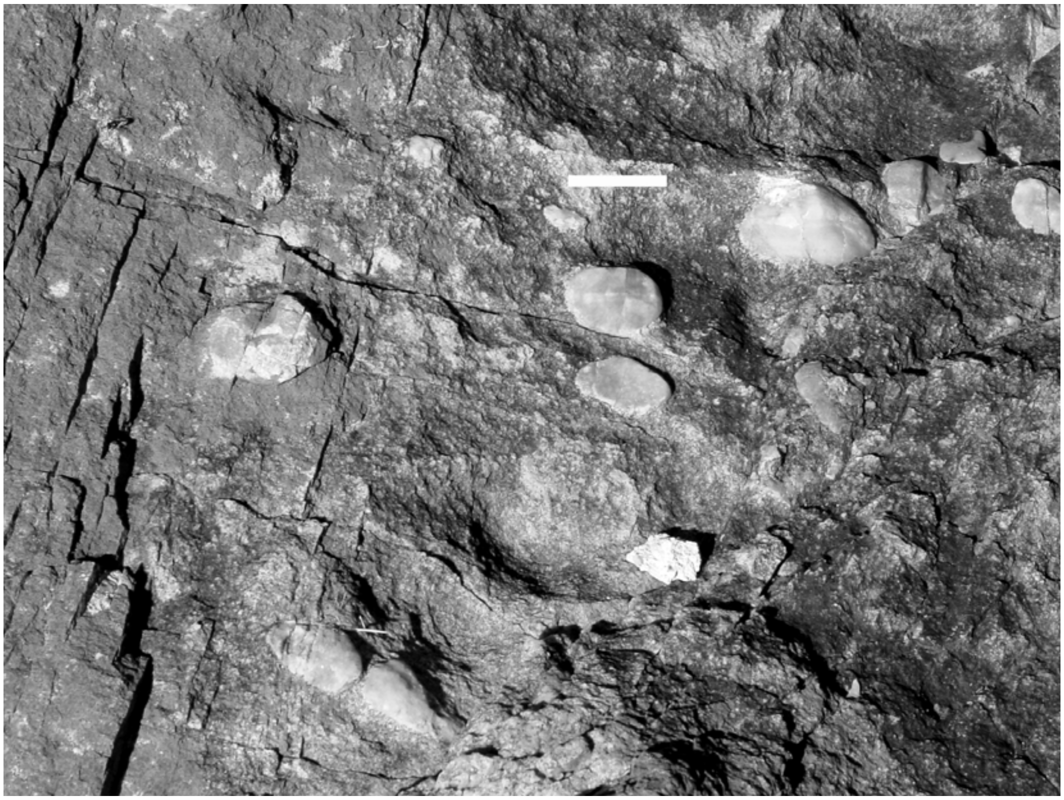

Figure 4.5: Table Mountain Sandstone, the parent material of the Klasies River caves, with quartz cobbles as inclusions. White bar is 10 cm.

Chapter 5: The Still Bay

The Context of the Still Bay

In the scheme proposed by Wurz (2002) for the MSA of the Cape the Howiesons Poort sub-stage is preceded immediately by the Still Bay sub-stage (Table 1.1). This is possible or, as seems more likely to me, there maybe some intervening period of time of unknown duration during which different technological choices were being made. While Still Bay archaeology has been known for some time (as will become clear in my discussion below), its current prominent role in the debate over the nature of MSA technological choices and behavioral modernity comes from two recently discovered and excavated sites, Hollow Rock Shelter and, especially, Blombos Cave. By chance, both sites became known to archaeology in the same year, 1992. These two sites with abundant bifacial lithic technology are located in different parts of the known geographical range of the Still Bay and were initially identified by different archaeologists (Figure 5.1). The settings and artifact preservation at these sites is quite different and the latter is especially favorable at Blombos Cave. This dune-sealed cave with good organic preservation (described in some detail in Chapter 1) is also the first place that the Still Bay was reliably dated, to about 74,000 BP (Henshilwood *et al.* 2004). Hollow Rock Shelter now supports the dating of the Still Bay layers at Blombos (Feathers, personal communication). Hollow Rock Shelter also plays the critical role of making the Still Bay less anomalous. Just as is the case for the

Howiesons Poort, the Still Bay predates the period of time 40-50,000 years ago when, under the Late Upper Pleistocene Model, fully modern behaviors arose. While accepting the Howiesons Poort as fully modern behavior requires only a few thousand years shift in the timing of the supposed Neural Advance of that model, the Still Bay extends that boundary at least 25,000 years older than the model allows, effectively nullifying it.

The Still Bay Industry (or now sub-stage) of the Middle Stone Age has a long history in the archaeological literature of South Africa. Artifacts from what we now call the Still Bay were described in print by Sir Langham Dale in 1870 in two articles in Cape Monthly Magazine, in which Dale assigned them to the "Cape Flats culture" a grab-bag of stone implements exposed in the dune fields near Cape Town (Dale 1870). More importantly, Dale illustrated the artifacts as seen here, which are some of the earliest Paleolithic artifacts illustrated from the subcontinent (Figure 5.2). Probably due to the obviously artifactual nature of Still Bay bifacial points they were frequently the focus of collectors and antiquarians living in the Cape Colony in the late nineteenth and early twentieth centuries. Burkitt (1928) reports them among the first artifacts sent back to England in the nineteenth century. Colonel Hardy, Mr. Mossop, and Mr. Jagger collected the Fish Hoek valley on the Cape Peninsula, Mr. Victor Peers and his son Bertie Peers excavated Skildergat (now usually referred to as Peers Cave), and Mr. Frans Malan excavated a large deposit eroding from the dune field at Cape Hangklip.

Another of these early antiquarians, the physician C. H. Heese, collected a number of surface sites near Still Bay including Blombos Sands, near the modern cave excavation, Kleinjongensfontein, and the site of Blombos Schoolhouse that yielded the singular artifact known as the Blombos Bo (Figure 5.3). Importantly, these collectors corresponded with one another, sending copies of photographs of artifacts, confirming that they were all talking about the same phenomena.

A Rock by Any Other Name

The naming of this sub-stage has been the source of a variety of spellings and some confusion, a short history of that terminology (and confusion) is provided here. As stated earlier the first Stone Age artifacts recorded from South Africa were of this type (Dale 1870). Sir Langham Dale published an illustration of two Still Bay bifacial points under the pseudonym Δ (Greek letter Delta) in an article in Cape Monthly Magazine in 1870 as artifacts of the “Cape Flats” type. The “Cape Flats” designation was based upon several surface sites and consisted of artifacts which would now be recognized as representing a broad swath of southern African prehistory. The term “lance-heads of the Solutrean type” is applied to these same artifacts in 1911 (Peringuey 1911). Partly to remedy this confusion and partly to honor another early antiquarian (C. H. Heese), the giant of early South African archaeology, A. J. H. Goodwin (1926a) proposed that the term “Stilbaai type” be used to designate sites in the western Cape that contain fully bifacial points. Heese had discovered a large number of finely flaked bifacial points at the Kleinjongensfontein dune field south of Riversdale, near Stilbaai (J. Deacon 1979).

After a meeting of the South African Association for the Advancement of Science “several of the keenest students of stone implements in South Africa conferred…and agreed to adopt the following terminology in the description of their finds” (Goodwin 1926b:784). The term “Stil Baai Industry” and, in the same article the correct Afrikaans spelling of “Stilbaai”, as part of the Later Stone Age (there was no Middle Stone Age in their scheme), occurring before Wilton, was agreed on. This odd combination of Afrikaans spelling and English structure was, however, short-lived. Two years later Goodwin used the term “Still Bay” in an article placing it in the newly created Middle Stone Age (1928a) and again in an article describing Dale’s original collection (1928b). Also in that year M. C. Burkitt published a general text, “South Africa’s Past in Paint & Stone”, in which the term “Still Bay culture” was used (Burkitt 1928). Consistency in terminology seems to have finally arrived as the next year Goodwin and C. Van Riet Lowe (1929) continued to use “Still Bay”.

In 1935 Goodwin also used “Still Bay” in his history of the investigations of South African prehistory (Goodwin 1935). This consistency faltered soon thereafter and Goodwin used the term “Stillbay” in his general text on South African prehistory, “The Loom of Prehistory” (Goodwin 1946). This time

Goodwin has used the odd combination of English spelling and Afrikaans structure, having now exhausted all four possible combinations of these two languages in this term. In the 1950s J. A. Mabbutt (1951) and R. P. Gatehouse (1955) used the term “Still Bay” in describing the collection of F. Malan at Cape Hangklip. At the same time B. D. Malan used “Stillbay” in his descriptions of Tunnel Cave and Skildergat Kop (Malan 1955). G. Summers compiled a guide to nomenclature for the South African Museum to ensure consistency in coding materials in 1970 (G. Avery, personal communication) and used “Still Bay” based on Goodwin. R. Mason (1962) and C. G. Sampson (1974) continued with “Stillbay”, although both were working primarily in areas that are outside of the Still Bay distribution. The following year the first analyses of a bifacial MSA assemblage in some time, G. Schirmer’s monograph on Dale Rose Parlour, used the term “Still Bay” (Schirmer 1975). The next published analysis of a Still Bay site, U. Evans’ honors thesis on Hollow Rock Shelter, used the term “Stillbay” (Evans 1994). Nearly simultaneously C. Henshilwood and J. Sealy publish the first description of Blombos Cave, using the term “Still Bay” (Henshilwood and Sealy 1997). The Blombos team has continued to consistently use “Still Bay” in their reports. H. J. Deacon and J. Deacon in “Human Beginnings in South Africa” reverted back to “Stillbay”, referring to it as “the modern spelling” (Deacon and Deacon 1999:100). Of what they felt “Stillbay” was the modern spelling is unclear, as “Stilbaai” appears to be the modern spelling of the body of water and “Still Bay (and Still Bay West)” appears to be the modern spelling of the town on most governmental maps. Goodwin coined the term and used “Still Bay” most consistently of all of the variants. Researchers actually working with the material have used “Still Bay” more frequently than other variants, and “Still Bay” and “Stilbaai” are the only two variants that are linguistically and geographically correct. Interestingly in Heese’s own unpublished notes on his substantial Still Bay collections he used Stilbaai and Still Bay interchangeably, but never Stil Baai or Stillbay (Heese n.d.). The weight of precedent goes heavily to the use of “Still Bay” when referring to this unique archaeological phenomenon and this spelling is used most recently by Wurz (2002) in her proposed MSA scheme.

Place and Time

The distribution of the Still Bay was noted from the early twentieth-century to be confined to a discrete area between the Atlantic and Indian Ocean coasts and the Cape Fold Mountains and more than seven decades of archaeological research continues to support this (Figure 5.1). Other MSA hafted bifacial point traditions can be found in South Africa, including the hollow-based points from Umhlatuzana (Kaplan 1990) in KwaZulu-Natal Province and the typically tear-drop shaped points of the Pietersburg Complex (Mason 1962, Sampson 1974) in the Free State Province. These all appear to be typologically and geographically distinct. The Pietersburg points from Border cave have been dated to around 82,000 BP, of similar age as the Still Bay (Grün and Beaumont 2001). It is unclear at this time what the relationships and durations of each of these hafted bifacial point traditions are.

Goodwin invited his mentor at Cambridge, Miles Burkitt, for a grand tour of South African prehistory in 1927. Burkitt published the first general text on the subject the following year, in which he described the Still Bay as marking "the arrival of Neoanthropic Man" in South Africa (1928:88). In his conception these modern peoples obviously came from Europe and migrated south at only 12,000 years ago, but his observations on the technological modernity of the Still Bay remain. Other writers used the term "Solutrean-like" for the bifacial points and noted other Upper Paleolithic analogues and similarities in the toolkits. The early century interest in the Still Bay Industry lapsed in absence of new finds and some researchers began to doubt the validity of the term by the 1970s (e.g. Sampson 1974).

Recently, the excavations at Blombos Cave by a team led by C. Henshilwood have returned the Still Bay to prominence. Blombos Cave is only the second site with a large Still Bay component subject to modern excavation (Hollow Rock Shelter being the other) and is the only one with organic preservation. Blombos Cave provides us with dates and strong associations with worked bone and ochre. Zenobia Jacobs and Chantal Tribilo, utilizing OSL on sediments and TL on burned lithics, respectively, have provided us with good and concurring dating estimates for the Still Bay of 74,000 ± 5,000 BP, placing it at the OIS 5a/4 transition (Table 5.1). These dates correspond to the only description (from Peers Cave) of a Still Bay deposit followed by a Howieson's Poort one. This relationship has been misinterpreted in the past, because of confusion about terminology, although Keith (1931) described it correctly. This confusion has been recently cleared-up by Royden Yates, utilizing the Peers' original notes. The confusion comes from the use of the terms "developed Still Bay" and "coarse Still Bay", which were read by many to mean two different phases of the Still Bay, but which actually meant, for the developed Still Bay, the presence of bifacial points, and, for the coarse Still Bay, what would be called MSA 3 or 4 or post-Howiesons Poort today (Royden Yates, personal communication). Additionally, the single Still Bay point from Klasies had fallen from the face of the deposit (Singer and Wymer 1982:105). Singer and Wymer reconstructed its original position using adhering sediments and placed it at the very top of their MSA II, just below the HP. This reconstruction fits very well with the temporal information from Blombos Cave. The application of OSL methods to the Still Bay site of Hollow Rock Shelter is in agreement with the dating estimates for Blombos Cave (Feathers, personal communication). The ongoing University of Cape Town excavation at Diepkloof has revealed a deposit up to 30 cm thick bearing neither the bifacial points of the Still Bay or the backed pieces of the Howiesons Poort, but containing MSA artifacts, between the two (Parkington, personal communication).

Still Bay Study Goals

With this background I began my investigation into the Still Bay using existing collections of artifacts. I had several reasons and goals for this study. First, no comprehensive study of the Still Bay had ever been done and, in light of the finds at Blombos Cave and their importance for understanding our prehistory generally one was needed. Second, I wanted to compare the Still Bay to the subsequent Howiesons Poort technologically, not just typologically. As part of this I wanted to see if there was evidence for transition or overlap between these two important technologically defined sub-stages. Third, I wanted to begin to investigate tool function beyond calling them lance-heads and assuming that is what they were used for. Fourth, I wanted to investigate stylistic unity for bifacial points described as Still Bay. That is, are all of these bifacial point similar in style or are there assemblages that are clearly different. And, perhaps the most challenging, I had to utilize poorly excavated or poorly recorded museum and university collections to a great degree in accomplishing these goals.

Site and Collection Descriptions

Blombos Cave

Blombos Cave is not included in the analyses described in this chapter. It is the only known Still Bay assemblage of any size that is not included here, but the finds at Blombos Cave are critical in understanding this sub-stage and are the main reason why this sub-stage is of renewed interest in modern human origins research. The lithic materials from Blombos Cave are under analysis by Marie Soressi who has generously discussed her materials with me at length. Due to this broader importance and the importance of this site to the Still Bay a brief description of Blombos Cave and its materials is provided here summarized from Henshilwood and Sealy (1997), Henshilwood *et al*. (2001a, 2002, 2004), Henshilwood (2004), and Soressi and Henshilwood (2004).

Blombos Cave is located on the Indian Ocean coast west of the modern town of Still Bay. This cave is very near the Still Bay dune site of Blombos Sands (see below) and care must be given not to confuse the two. Blombos Cave sits high above current sea-level in a wave-cut cavern in Table Mountain quartzitic sandstone bedrock. A dune containing calcrete sits above the site and this has acted as a buffer to the groundwater resulting in excellent artifact preservation, including organic materials. The cave was nearly sealed by a dune on the bluff face containing the cave and was discovered due to some LSA archaeological materials on the slope in front of the cave. The upper layers of the cave contain LSA deposits, including fauna, and those were the initial target of the excavation at the cave, which was intended as an examination of pastoralism in the Cape. This LSA deposit sits on a sterile dune layer (BBC Hiatus) marking a hiatus in human use of the cave and sealing the deeper MSA deposits. This dune has been dated by OSL to 69,000 ± 5,000 years ago (Henshilwood *et al*. 2002). Analysis of single grains of sand in the dune suggest minimal disturbance of the dune since that time (Jacobs, personal communication). The dune sits immediately on top of Still Bay deposits (BBC M1) which have been dated to 74,000 ± 5,000 years ago by both OSL sediments and TL on burned lithics (Henshilwood 2004). The BBC M1 deposits have a large number of bifacial points in various stages of manufacture and have been interpreted by their analysts as being a bifacial point workshop (Soressi and Henshilwood 2004). Ochre that has been engraved with repeating geometrical patterns were recovered from these layers (Henshilwood *et al*. 2002). Also from the BBC M1 layers a set of perforated shell beads has been recovered (Henshilwood 2004).

The presence of clear symbols and personal ornamentation in the Still Bay layers at Blombos Cave marks the earliest well-dated occurrence of both phenomena in the known archaeological record. These require accounting for in any explanation of modern human evolution. That they occur in deposits that bear lithic materials that have long been remarked upon for their sophistication only reinforces the importance of this site. Clues to the co-occurrence of Still Bay bifacial points with other precocious artifacts have been around for quite some time and these will be discussed for each of the sites that follow here. What is critical to understanding the Still Bay is that at Blombos Cave, the lone Still Bay site to date that has organic preservation, was the subject to modern excavation techniques, and has been well-dated, yielded abundant evidence for the behavioral sophistication, modernity if you must, of MSA peoples. That the Still Bay must now be considered the upper limit, the absolutely most recent date, at which this sophistication manifests in the archaeological record, is pressed home even further by the deeper deposits at Blombos Cave itself.

In the lower layers of the BBC M1 deposit a transition to flaked stone bifacial points from bone point technology is clearly underway. The finely worked bone points that are found mostly in the deeper BBC M2 deposit push the antiquity of that sophisticated tool-making technique to new depths. Bone points are known from other MSA deposits on the Cape Coast (notably at Klasies River, Singer and Wymer 1982), but not in the numbers recovered from the BBC M2 deposits. The large amount of worked bone in the BBC M2 deposits makes it much more difficult for them to be dismissed as "anomalous" or "intrusive LSA" as has been frequently done for the single worked bone artifacts typical of other MSA deposits in the Cape. More importantly than their numbers the bone tools have been assessed for protein preservation, in comparison to LSA bone from the cave, and found to conform to the MSA chemical profile (Henshilwood and Sealy 1997, Henshilwood *et al*. 2001b). The transition between the bone point industry and the subsequent Still Bay industry in Blombos Cave appears to be gradual and continuous with no abrupt hiatus or reoccupation that seems typical in cave deposits of this antiquity. This is quite different from, for example, the transition between the SAS member and the subsequent HP member at Klasies. For the first time in the MSA of the Cape convincing evidence of stylistic transitions between culturally defined traditions appears to be clearly represented. The duration of these periods also appears to be on the scale of thousands of years and is of a similar order of the duration of much more recent periods of similar type, also for the first time. Demonstrating that this pattern is typical, rather than anomalous, for the MSA will be a major goal of archaeological research in the region for the foreseeable future.

Blombos Sands

Blombos Sands (also Blombosch Sands) is a dune site west of the town of Still Bay and near the Blombos Cave site. The assemblage analyzed here comes from the Heese collection and a wide variety of fine-grained raw materials are represented in the Still Bay materials. The dune field is itself quite extensive, covering several hectares, and materials were collected over a period of decades by Heese as they became exposed (Heese n.d.). As would be expected for an open site that is at least 70,000 years old organic preservation is poor. The exception being a single bone point included in the materials from this site that is consistent with the bone MSA points from Blombos Cave (Figure 5.4). The metrics for that point are included as the last case on the bifacial point table for Blombos Sands. Less wind polish is noted on the lithic artifacts here than at Cape Hangklip, suggesting a brief period of surface exposure. The materials recovered from this site may have a direct affinity with the Blombos Cave site, but this has yet to be investigated in any way. It is likely that if there is a relationship between the two that the cave represents a specialized manufacturing locus, whether ritualistic or not, and the dune field artifacts represent open living/hunting sites. It should be noted that impact fractures are absent on the Still Bay bifacial points at Blombos Cave (Soressi and Henshilwood 2004), but are present in small numbers at this site and at the similar Kleinjongensfontein.

Blombos Schoolhouse

A single artifact is represented from the site of a schoolhouse west of the town of Still Bay. Discovered during a nature walk from the newly constructed schoolhouse in 1928 this artifact was named the "Blombos Bo" (or Blombosch Bo). Recovered from black sands that were reported to contain other MSA artifacts this is the largest Still Bay bifacial point known (Figure 5.3). Except for its remarkable size this bifacial point conforms nicely in form to the type. Heese (n.d.) does not report any other bifacial points from the same locality, although he surely looked extensively. No modern investigations of the schoolhouse site have been undertaken.

Cape Hangklip

Cape Hangklip is the first cape east of the Cape of Good Hope. It is the westernmost cape that is entirely on the Indian Ocean. The Earlier Stone Age

(ESA) site at Cape Hangklip is quite famous and has been the subject of many investigations by numerous luminaries of archaeology including, but not limited too, Goodwin, Kenneth Oakley, the Abbé Breuil on an extended visit from Nazi-occupied France, Glynn Isaac (as an undergraduate in the 1950s), and Garth Sampson (1962). Less well-known is a MSA component that is apparently from a much smaller and discrete area slightly upslope (inland) from the ESA site (Malan n.d.). This site was collected by Frans Malan in 1934 (Gatehouse 1955), a local farmer with an interest in antiquities, and accessioned to the South African Museum as 6229, in 1962. A letter from Malan to Heese in the Heese papers at the South African Museum is the only document that records the setting and circumstances behind this assemblage (Malan n.d.). In that letter Malan illustrates the stratigraphic relationship between the MSA component and the better known ESA occurrence (Figure 5.5).

Unfortunately, Malan gives no plan view figure and it is unclear where along the inland side of the large ESA site the MSA site is or was located. Gatehouse (1955) and Mabbutt (1951) both make mention of the MSA site is their articles on the ESA site, but also fail to locate it on any map. While working on the ESA site Sampson saw no evidence of the MSA occupation (personal communication). The area was both vegetated and active sand dunes during the time of Malan's collection and the dune field is clear in Gatehouse's aerial photographs (Figure 5.6). Today nearly all of the area that potentially is the location of the MSA site is overgrown with the invasive shrub Rooikrans (*Acacia cyclops*). I made two trips to Cape Hangklip with R. Yates of the South African Museum in 2003 and then again in 2004. The first trip was especially disappointing in that we could not even locate the ESA site due to the heavy ground cover. We visited the site with Dr. Peter Joubert of Lipkin Road, Betty's Bay, and Mr. Bo Atwell of Betty's Bay. Mr. Atwell was especially informative as he had been on the site with Gatehouse in the 1950s. During the second trip a portion of the ESA surface scatter was located (Figure 5.7) although again the vegetation prevented relocation of the MSA site. The removal of Rooikrans is required by South African law and in the near future better surface exposure and the ability to actually walk in the vicinity of the MSA site may be possible, the contact for the local removal program is Monique van Dyke (0282714010).

Malan (n.d.) reported recovering the MSA artifacts from an exposure in a vegetated dune. My attempts at locating descriptions of the site or of the collection of artifacts in the collected papers at the South African Museum and the University of Cape Town have been unsuccessful. Attempts at contacting descendents of Frans Malan in hope of locating additional notes have also proved unsuccessful, Malan being a common surname in the Cape. That F. Malan had a set of detailed notes on the site is evidenced in this quote from Gatehouse, "I am indebted to Mr. Malan for giving me access to his catalogues and the Abbé Breuil's notes" (1955:344). As it is it is quite fortunate that we have the letter that

Malan wrote to Heese, discussing his finds at Cape Hangklip. Included with that letter are a set of high quality black and white artifact photographs (Figure 5.8). All of the photographed artifacts from Malan's collection are still in the South African Museum collection except for two. One of these artifacts is a large white quartz bifacial point that could easily have been loaned to another museum as a type example.

The other missing artifact is perhaps more interesting. It is (or was) a large ochre pencil that was worked on the visible face, as is clearly apparent on the high quality photograph of Malan's (Figure 5.9). The working of this ochre piece is probably by repeated stabbing with a stone tool, although it may be impossible to know without examining the actual artifact (I. Watts, personal communication). The Cape Hangklip materials collected by Malan were accessioned into the collections of the South African Museum and have remained as a single box. The missing worked ochre is not in that box and no other materials from the MSA site at Cape Hangklip have been located at the museum. It is possible that the ochre was never donated to the museum. It is also possible that the ochre sits in a box in the museum stores and will eventually be relocated. What is clear is that Malan recognized the importance of the worked ochre enough to take a photograph of it. It is worth noting that this makes at least three Still Bay sites (Blombos Cave, Hollow Rock Shelter, and Cape Hangklip) with worked ochre, a pattern that can not be described as anomalous.

Artifact preservation at Cape Hangklip is, like other open dune field sites, poor. All of the known preserved artifacts are of flaked stone, with the exception of the mineral ochre artifact. Malan (n.d.) makes no mention of bone in his letter regarding the site. Wind erosion is apparent to varying degrees on nearly all of the artifacts. It is unclear whether this is the result of long-term surface exposure prior to burial in the dunes or as result of more recent exposure of the materials, or of a combination of both. The depositional conditions of this assemblage are impossible to assess without the rediscovery of whatever portions of this site remain *in situ*. Other than the foliate Still Bay bifacial points, which were the focus of my analysis, this assemblage is remarkable in many ways.

First, the bifacial points themselves are exceptional in their size, representing the largest bifacial points from the Still Bay sub-stage, other than the Blombos Bo, known (Table 5.2, Figure 5.10). These bifacial points were displayed as representative of the Still Bay type in the main hall of the South African Museum until 2004 when the archaeology displays were completely renovated. It is worth noting that the artifacts displayed as the Still Bay type specimens in a prominent museum for at least forty years failed to elicit any professional interest in the assemblage. The Cape Hangklip assemblage is also exceptional in that the vast majority of all classes of MSA artifacts are made on a fine homogeneous silcrete (almost to the exclusion of every other class of raw material). This includes things like blades and convergent flake-blades that would typically be made on quartzite in other Cape MSA assemblages. Related to the unusual raw material representation in this assemblage is an unusually high degree of retouch present in the non-bifacial portion of the assemblage. The high representation of silcrete makes identifying retouch easier (or even possible) suggesting that the general observation that retouch is rare or absent in MSA assemblages is simply the result of difficulties in assessing retouch and edge damage in coarse-grained raw materials. An attempt at dealing with this problem is made in Chapter 7 in the Pinnacle Point 13B assemblage.

Dale Rose Parlour

Also known as Trappieskop or Eales Cave (and the boxes for this assemblage at the University of Cape Town have been erroneously labeled “Eagles Cave”), Dale Rose Parlour is a small shelter on the side of a hill named Trappieskop facing the Fish Hoek valley. Skildergat (Peers Cave) is visible on the opposite side of the valley from the entrance of this shelter and Hangklip is visible from Trappieskop across False Bay. That three of the largest Still Bay assemblages known come from sites that are visually connected is somewhat remarkable. The relationship between these sites has not been explored in any meaningful way.

This site was “excavated” over a Christmas break by three high-school boys in 1936 and the assemblage has spent the past 50 years in the teaching collections of the University of Cape Town where they have been accessed by an untold number of students. It is clear that some of the finer complete silcrete bifacial points are no longer in the collection. Schirmer (1975) has produced the only description of the materials and the circumstances of the excavation and this summary is taken largely from her work. Artifact preservation at Dale Rose Parlour is poor, with only lithic material represented. The setting of the shelter is unusual in that it sits high above the valley floor and is accessible only by climbing to the top of the hill then coming down a crevasse onto a small ledge. It is difficult to see from below and was not found by the Peers' during their survey of shelters and caves on Trappieskop in the 1920s. This site has a bifacial assemblage that most resembles that at Blombos Cave, dominated by large numbers of bifacial points in all stages of manufacture. The difficulty in reaching this site would not have been conducive to everyday living or as a hunting station, but may have been important in its choice as a bifacial point manufacturing shop. Blombos Cave is similarly (though not quite as) difficult to reach; why these workshops are found in settings that are somewhat odd is open to speculation. Schirmer (1975) interviewed all three of the boys (then grown men) who had excavated the site and attempted to reconstruct the stratigraphy and reorganize the collection. The statements of the three men were often at odds with one another and it is unlikely that the reconstruction can ever be trusted fully. A portion of the deposit remains in the site today and a new excavation utilizing modern techniques seems warranted in light of the finds at Blombos Cave and the similarities of this assemblage to that one. Minimally, dating of the sub-stage could be improved by adding data from here.

Hollow Rock Shelter

Located during a survey in the Cederberg Mountains, near the town of Clanwilliam, South Africa, by the Spatial Archaeology Research Unit of the University of Cape Town in 1992 this site was given the field designation Sevilla 48 (for the name of the farm that it was located on) and is currently referred to in the literature as Hollow Rock Shelter. The name derives from the fact that the site is in fact almost entirely confined to the interior of a hollow beneath a single large rock. A systematic excavation was undertaken in 1993 by R. Yates and U. Evans. This excavation was analyzed and reported by Evans in an exemplary honors thesis and subsequently as an article (Evans 1994). This article serves as the source for much of the background information on the site summarized here.

Artifact preservation at Hollow Rock Shelter is very poor. No organic artifacts or faunal materials were recovered and some of the lithic artifacts, notably the coarse-grained silcrete, were in such poor state that they had to be impregnated with glue in the field to prevent their disintegration. Only lithic and mineral materials were recovered during the excavation.

The lithics from Hollow Rock Shelter exhibit a wide range of technological approaches, with continued use of Levallois techniques to make flakes, points, and blades and the regular manufacture of hafted bifacial points. The single backed piece observed at the site was located in a small erosional gully leading out of the shelter (R. Yates, personal communication). Quartzite, coarse silcrete, fine silcrete, hornfels, and quartz are all used to make tools. The bifacial points are made on the more durable raw materials with hornfels being excluded.

A concentration of unmodified quartz crystals was recovered from Hollow Rock Shelter (Evans 1994). Of the total of 39 recovered 34 were from a single 5 cm spit and 1 m square (Figure 5.11). All the remaining crystals were from within one unit or one 5 cm spit of this spit. The crystals do not have usewear apparent on them and are of uniform size. It is suggested here that they represent symbolic behavior, although a purely functional explanation may eventually found. The ochre from Hollow Rock Shelter contains pieces with notched edges that echo the ochre modification from the Still Bay layers at Blombos Cave. Again, symbolic behavior seems to be the most reasonable explanation for these artifacts at this time.

Kleinjongensfontein

The site of Kleinjongensfontein was collected over a number of visits spanning many years by the antiquarian Heese. This dune field site is near the modern town of Still Bay and was one of the collections that led to the naming of the Still Bay Industry (now sub-stage). Materials from Kleinjongensfontein are made from a wide variety of fine materials, including the largest chalcedony artifact I have seen in the Cape MSA (Figure 5.12). For dune-deposited materials there is little evidence for wind etching on the lithics and that likely indicates minimal exposure on the surface for most of these materials. The spatial relationships between artifacts from this site and how large of a total area they were recovered from are not known.

Skildergat (Peers Cave)

Skildergat, also known as Peers Cave and Fish Hoek Cave, is a large cave with a panoramic view of the Fish Hoek Valley. The Fish Hoek Valley cuts across the Cape Peninsula, with the Atlantic Ocean at the western mouth and the Indian Ocean at the eastern mouth. The cave is wave-cut and during the higher sea levels of the Middle Pleistocene the valley would have been an ocean channel between two islands. During its occupation the cave would have had a dominating position for hunters over herd animals moving through the valley. During sea level regressions large coastal grassland plains would have been exposed on both sides of the peninsula, increasing the importance of the valley as a migratory pathway.

The deposits in the cave were at one time extensive with LSA, MSA, and ESA artifact-bearing layers having been removed in multiple excavations. The name of the cave, Skildergat, is Afrikaans for “painted cave” and Holocene-aged rock art is still visible there today. The most famous and largest in scale of these excavations was carried out over a series of years in the 1920s by the father-son team of Victor and Bertie Peers who labeled the cave A/101 in their survey of the valley. The Peers’ utilized mining techniques to remove massive amounts of deposit, much to the dismay of later researchers. In places explosives were used to remove roof-fall boulders. The Peers’ recovered nine LSA skeletons in various stages of completeness. One of these, a robust individual usually referred to as “Fish Hoek Man”, was recovered from nine feet below the top of the archaeological deposits and was touted by the famed anatomist Sir Arthur Keith as the largest-brained ancient African (Keith 1931). It is now known through radiocarbon assay directly on Fish Hoek Man (P4) that he was a Holocene-aged (~4,800 BP) LSA individual and not from the MSA (Singer, personal communication). No full description of all of the skeletal materials has been published, although one is in preparation by Ronald Singer.

Similarly, no full description of the Peers’ excavations at Skildergat has been published, although Goodwin (1949) published a summary of their notes. One of the important parts of that summary was a basic stratigraphic relationship of (beginning at the top) LSA, MSA (“Coarse Stillbay”), Howiesons Poort, Still Bay

("Finer Stillbay"), MSA ("Proto-Still Bay"), and ESA. This basic stratigraphy has held up well over time and is also the source of some confusion. This confusion is the result of the use of variants of the term "Still Bay" by the Peers' to describe all of the MSA material. Royden Yates has recently examined this issue using the Peers' original notes and plotting artifact depths for the bifacial points. He found that it is likely that the Howiesons Poort deposit overlies and is not interdigitated with the Still Bay deposit as has been reported by Volman (1981) and others (Yates, personal communication). Most of the Still Bay bifacial points that I examined from Skildergat were from the Peers' collection, although from the description of their finds the collection at the South African Museum is a pale shadow of the original collection, some of which appears to be housed in British museums (Mitchell 2002b).

A subsequent excavation of the cave by Jolly in the 1940s (Jolly 1947, 1948) produced a similar, and similarly vague, stratigraphic sequence. There are some contradictions with the Peers' description of the relationship between the LSA, Howiesons Poort, and Still Bay layers and these may never be resolved as between the two almost all (if not all) of the upper deposits have been removed (Volman 1981). Subsequent excavations by Anthony (1972) have recovered ESA or early MSA (Volman 1981) materials from the cave. Like the Peers' collection the Jolly collection seems to be missing a large number of diagnostic artifacts. Since it is a later excavation one possibility is that the materials were recovered from *below* the Peers' Still Bay layers and represent some temporal stylistic difference in MSA bifacial point manufacture. In any case, the current conditions of the site and the generally poor state of the excavation reporting from the site preclude a definitive conclusion.

Composite Images

Every bifacial point and bifacial point fragment and unifacial point or uniface fragment had its shape recorded as follows. I oriented each fragment tip end (or where I thought the tip had been) up and, estimating the original center of the point, traced its outline and then scanned all of the outlines into Adobe Illustrator. Setting the opacity based on the number of pieces (for example if N=10, then I set the opacity at 10%) I created the composites illustrated here (Figures 5.13-5.20). Figures 5.13 and 5.14 illustrate quartzite and silcrete bifacial points from Dale Rose Parlour (Trappieskop). The similarity in size(s) and form, even between the different raw materials, is notable. Figures 5.15, 5.16, and 5.17 present composite images of the same raw material classes with the addition of quartz for the bifacial points from Hollow Rock Shelter. Similar patterns to those at Dale Rose Parlour in size and form emerge when all the fragments are compiled. The quartz artifacts are smaller than the other classes of raw materials (Table 5.2) and this probably reflects the smaller package size for that raw material. Silcrete bifacial points from Peers Cave (Skildergat) (Figure 5.18) and Kleinjongensfontein and Blombos Sands (Figure 5.19) also follow this patterning. An interesting observation of the Peers Cave materials is that three of the bifacial points from the

Peers' collection differ in size and form from those typical of the Still Bay. These are much small and have a tear-drop shape, similar to the bifacial points of the Pietersburg complex. These can be seen in the center of the composite image for Skildergat (Figure 5.18). As the Peers' excavation was quite extensive these could represent a different period of time from the Still Bay sub-stage, or a variant of the Still Bay that is not seen in any other assemblage. Figure 5.20 presents a composite of the silcrete bifacial points from Cape Hangklip, which deviate in size by being larger, but otherwise follow the patterning of form at the other Still Bay sites (Table 5.2).

The use of composite images here provides a large amount of useful visual information on the bifacial point assemblages. Composite images show variability in size and shape well. In addition the composite images can show what portions of the bifacial points are over- or under-represented in each assemblage and what breakage patterns are common. The use of composite images provides assemblage scale visual summaries that allow for easier comprehension of complex metrical data.

Standard Measures of Still Bay Bifacial Points

Standard measures of all bifacial points, unifaces, and bifacial point fragments from Still Bay assemblages are presented in Tables 5.2 – 5.10. The methods used to get these measures, and all other lithic measures in this dissertation, are provided in Appendix B. In making any calculations the measures where all rounded to the nearest millimeter. However, the raw data as they were recorded from the calipers is presented here.

The vast majority of the bifacial points examined from all assemblages were in fragmentary form. The exception being in the "Miscellaneous Still Bay" table in which individual points collected and accessioned into the South African Museum collections were nearly all complete bifacial points. Of the 216 clearly Still Bay bifacial point specimens examined 41 were complete or nearly complete and 175 were fragments.

Evidence for Hafting

Several complete Still Bay bifacial points examined show evidence for having been hafted. This is inferred from clear lines where resharpening and edge maintenance of the bifacial point consistently stop at the same place between the mid-point and the base (Figures 5.21, 5.22). Rather than a notching inward to provide an attachment, this resharpening leaves the base wider than the rest of the point. The hafting line is quite high up the point, always somewhere between one-third and halfway from the base to the tip. The basal sections are also robust (thick in cross-section) rather than thinned, as is common for projectile armatures. A robust hafting element, large proportion of the point inside the haft, and consistent evidence for resharpening all support the primary interpretation of Still

Bay points as bifacial knives. Of the *complete* points examined from all Still Bay assemblages (n=41) 34% exhibit good evidence for hafting (n=14). Possible adhesive residue in the form of dark staining was observed on a basal fragment of a single bifacial point from Peers Cave. No other residues were apparent on any of the bifacial points or fragments and no special analyses have been applied to the possible adhesive.

Evidence of Impact Fractures

Fractures at the tip of a point were recorded as an impact fracture (Figure 5.23). These all show an obvious Hertzian initiation and in some cases the force of the impact appears to have been quite large. Impact fracturing is evidence for the tool having struck something hard forcefully during use. This could have been as a thrusted knife, thrusted spear, or thrown spear. Shea *et al*. (2001) provides experimental evidence that other contemporaneous lithic points in the Levant served as spear armatures at least some of the time. Five impact fractures were noted out of all of the assemblages examined (41 complete or nearly complete points and 175 fragments). All of the impact fractures were observed from open site (non-cave) assemblages, two from Cape Hangklip and three from Kleinjongensfontein. That no impact fractures were observed from cave assemblages, even though assemblage sizes from the cave sites is much larger, suggests differing activity foci for these different types of sites. Thirty-five cave site points that could be evaluated for impact fractures had none, whereas twentyone open site points yielded five impact fractures for a x^2 of 37.786 at .000 significance. In particular this reinforces the bifacial point workshop interpretation for Dale Rose Parlour and Hollow Rock Shelter. It was noted that no impact fractures were observed on the Blombos Cave bifacial points and an interpretation as a workshop was given for that cave site as well (Soressi and Henshilwood 2004). This then implies that the open dune Still Bay sites represent more vigorous use of the bifacial points, probably as hunting and butchering tools.

Bifacial Thinning Flakes

The presence of bifacial thinning flakes in the debitage from the well-excavated site of Hollow Rock Shelter and the poorly collected site of Dale Rose Parlour were quantified. To do this I focused on the silcrete portion of the debitage as it has a finer grain and is easier to characterize, especially as small flakes. Flakes were identified as being bifacial thinning flakes on the basis of the presence of acute platform angles, diffuse bulbs, and, often, faceted platforms. I counted and weighed all of the silcrete flakes from each excavation. For the Dale Rose Parlour assemblage this included the small flakes categorized as “chips” and for the Hollow Rock Shelter this included the “small flaking debris.” Ursula Evans kindly provided her original notes on the small flaking debris which were not published in her analysis of that assemblage.

In this way a percentage of “bifacialness” or a regression analysis could be arrived at for Still Bay assemblages and compared to other MSA assemblages. The use of a single raw material class, silcrete, in addition to making the identification of small flake characteristics easier (or even possible) removes comparative problems that may be resultant from engineering characteristics of differing greatly between raw material classes.

I also quantified the debitage from the Deacon and Deacon excavation of the Howieson’s Poort shelter in a similar way. Figure 5.24 shows the comparison of the silcrete debitage between the two MSA sub-stages as a scatterplot. The debitage from the Still Bay is clearly more bifacial and consistently so, with an r^2 of .79 and a $p<.05$. The regression for the Howiesons Poort is less robust with an r^2 of .32 and $p<.05$. This can be at least partly explained by the temporal trend in bifacial reduction apparent in the Howiesons Poort debitage. The two points on or above the Still Bay regression line are both from the deepest level excavated by the Deacons in 1965. The point representing the largest sample with no bifacial thinning flakes is from the uppermost level of that excavation. This comparison supports the idea that the Still Bay is both technologically and temporally prior to the Howiesons Poort, although I will suggest in my discussion of the Howieson’s Poort shelter collection (Chapter 6) that this assemblage is actually intermediate between the two. A robust r^2 for the Still Bay bifacial thinning presence in the debitage supports a consistent 5% presence of those diagnostic flakes; other MSA assemblages that I have quantified in this way, with some exceptions (see Chapter 7), generally approach 0% presence of bifacial thinning flakes in their debitage.

Discussion and Conclusion

Observations made on the comprehensive (minus Blombos Cave) survey of Still Bay bifacial points include obvious evidence for hafting (Figure 5.21) and for resharpening in the haft (Figure 5.22) and, much less frequently, impact fractures (Figure 5.23). A relative lack of impact fractures is partially explainable by the context of these assemblages. The larger Still Bay assemblages, especially Dale Rose Parlour and Hollow Rock Shelter, seem to match the interpretation of Blombos Cave as special bifacial point workshops (Soressi and Henshilwood 2004). At these sites breakage types and patterns can almost all be attributed to manufacturing errors. Whether a dichotomy exists between the points from open dune field sites and these workshops, with the open sites representing more actual day-to-day uses can not presently be resolved. Currently there are no modern unbiased collections from any open Still Bay sites for a comparative analysis. As discussed above, several attempts at relocating the “lost” site at Cape Hangklip by Royden Yates and myself failed to locate any substantial MSA deposits.

The presence of size classes and the robust hafts and resharpening suggest that many Still Bay points functioned primarily as knives, while others, with impact fractures, functioned as spear armatures, as has been long assumed. John Shea has analyzed the data presented here, as part of a larger examination of whether

MSA points in general were projectile armatures (thrown spears). He found that while some later MSA assemblages do conform to the aerodynamic characteristics of projectile armatures Still Bay points do not (Shea, personal communication). Still others, with extraordinary size and finish, seem to have served as symbols in the social realm (as suggested by Marean and Assefa 2004). These extraordinary bifacial points are the exception, rather than the rule and functional explanations, rather than symbolic or ritualistic ones, seem more appropriate at this time to explain the presence of the technology generally. This over-representation of aesthetically pleasing bifacial points in discussions of the Still Bay is not unusual in archaeology, but may lead to unnecessarily strained explanations for their presence in the record.

Still Bay bifacial foliates are consistently associated with other artifacts including, backed pieces, unifaces, bone points, worked ochre, and other possibly symbolic goods such as cached quartz crystals. In summary, completed Still Bay points often exhibit hafting and resharpening. Still Bay points very rarely exhibit impact fractures and this is only apparent at open sites. Raw material choices are specific for fine-grained/durable stone. Bifacial thinning flakes are consistently present and show a significant difference from other recognized MSA lithic industries. Reduction sequences from flake-blades are readily apparent and some reduction from bifacial cores can be inferred by the large crude bifacial points present in some assemblages and the package size limitations (small water-borne cobbles) of some of the preferred raw materials.

Howiesons Poort-like material, such as backed pieces, are weakly (but persistently) associated with assemblages containing Still Bay bifacial points. This may be due to the use of similar parts of the landscape by Howiesons Poort and Still Bay peoples, by the deposits of each having been laid down close in time, or by backed pieces originating earlier in the MSA than the Howiesons Poort sub-stage. It should be noted that in the well-excavated sites of Blombos Cave and Hollow Rock Shelter no backed pieces (excepting the previously mentioned single eroded one at Hollow Rock) were recovered. Bone points are securely associated with Still Bay bifacial points at Blombos Cave and that is the only excavated Still Bay site with bone preservation. A single bone point associated with Still Bay materials on the dune surface was collected by Heese at Blombos Sands.

The stylistically distinct Still Bay bifacial points are regionally restricted to the Cape Coast seaward of the Cape Fold Mountains. The Still Bay bifacial points appear in assemblages that have a discrete temporal range of between ~70,000 and ~75,000 BP. Still Bay bifacial points were hafted and served as multi-functional tools. The primary function of these bifacial points appears to have been as knives with a secondary function as spear armatures. Some Still Bay bifacial points apparently functioned as symbols and symbolic behavior is abundantly represented in other classes of artifacts associated with Still Bay points.

Knowing what we now know about the timing and the use of symbols during the Still Bay, largely from the remarkable finds and modern excavation of Blombos Cave, the observations of the earliest professional archaeologists in southern Africa have a new resonance. They believed that the Still Bay unquestionably marked the arrival of modern peoples in the subcontinent (Burkitt 1928). Although off by an order of magnitude on the timing of this technological period and biased toward a European origin, their basic conclusion is valid: That the makers of these artifacts exhibited the highest level of flintknapping skill, that the techniques used in their manufacture was undoubtedly “modern”, and the people that made and used these tools were “us”.

Table 5.1: Chronometric dating estimates and stratigraphic placement of Still Bay assemblages.

Site	**Technique**	**Age Estimate**
Blombos Cave	OSL	74,000 ± 5,000
Blombos Cave	TL (lithics)	74,000 ± 5,000
Hollow Rock Shelter	OSL	59,100 ± 4,500 (minimum age)
Peers Cave	Stratigraphy	below HP

Table 5.2: Mean lengths or estimated lengths for all complete or nearly complete Still Bay points, with standard deviations. BBS=Blombos Sands, CHK=Cape Hangklip, DRP=Dale Rose Parlour, HRS=Hollow Rock Shelter, KJF=Kleinjongensfontein, PC=Peers Cave, S=Silcrete, Qt=Quartzite, and Qz=Quartz.

SiteRawMat	Mean Length	N	Std. Deviation
BBS(S)	70.00	3	11.358
CHK(S)	93.60	15	32.469
DRP(Qt)	63.63	27	14.648
DRP(S)	56.45	20	11.816
HRS(Qt)	69.29	7	16.909
HRS(Qz)	39.00	2	1.414
HRS(S)	67.13	8	19.628
KJF(S)	72.10	10	11.628
PC(S)	64.00	6	26.676
Total	68.02	98	22.112

Table 5.3: Data table for Still Bay bifacial points, uniface, and a single bone point from Blombos Sands.

ID	Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element /base	scar density	comments	weight	Raw material
805	34.87	?		24.95		8.49	7	5	midsection only	10.9	tan silcrete
889	62.58	?	33.45	42.03	28.76	13.21	7	3	tip and base missing	40	tan silcrete
892	70.25	83.45	28.91	42.33	36.29	12.15	5	4	tip missing	40.6	tan silcrete
?	58.35	65.42	20.29	28.93	28.68	7.72	7	6	base missing	14.1	tan silcrete
862	58.33		15.96	23.57	23.55	7.15	6	5	uniface	11.6	tan silcrete
D199	57.93	61.67	16.77	19.42	15.23	7.68	4	5	tip missing	9.9	tan silcrete
803	64.18		5.77	8.28	9.82	6.44			bone point, polished, long bone groove	4.5	

Table 5.4: Dale Rose Parlour bifacial points.

Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/ base	scar density	comments	weight	Raw material
57.61		12.55	20.46	17.53	8.63	5	7	resharpened to near mid-length	9.3	silcrete
26.87	?		39.71		7.05	7	4	mid-fragment only	12.3	silcrete
74.31	99.81	25.09	39.26	31.16	13.73	7	4	tip and base missing	46.6	quartzite
49.42	?	19.35	30.27		12.83	7	3	base missing	15.3	quartzite
62.06		20.25	31.34	25.14	9.15	4	6		16.7	silcrete
51.43	57.93	17.88	27	25.96	13.67	7	2	unfinished	17.7	quartzite
43.74	?	20.65	26.5		10.21	7	4	base missing	11.8	silcrete
55.22		18.5	23.66	21.2	6.26	5	4		10.7	silcrete
44.15	?	23.84	38.63		9.29	7	3	base missing	14.2	silcrete
55.69		23.71	28.09	25.89	9.91	6	4		16	quartzite
49.51	65.51	19.04	21.55	19.57	8.67	2	3	tip missing	10.2	silcrete
33.77		14.78				7	6	tip only	3.5	silcrete
53.99	61.84	18.7	21.7		6.88	7	5	base missing	10.4	silcrete
25.13	?	15.98				7	5	tip only	2.2	silcrete
44.31	60.7	17.45	21.31	20.28	9.11	4	3	tip missing	9.4	quartzite
33.22	?	15.91				7	5	tip only	3.6	silcrete
29.81	?	23.51				7	6	tip or base only	6.1	silcrete
20.97	?		23.64		5.55	7	4	mid-fragment only	3.6	silcrete
52.09	63.05	14.48	17.99	16.06	6.71	7	4	tip and base missing	6.5	silcrete
56.33		16.12	27.79	28.4	10.27	6	4		17.7	silcrete
41.14	?	15.99	21.29		9.27	7	4	base missing	7.7	silcrete
49.94	?			35.94		5	5	base only	14.8	silcrete
48.68	52.76	14.28	16.87	17.17	6.52	5	5	tip missing, resharpening bevel	6.2	silcrete
36.22	?	16.29				7	6	tip only	4.9	silcrete

Table 5.4 (continued)

39.05	?	21.5				7	4	tip only	7.9	quartzite
30.42	?	18.88				7	4	tip only	4.5	silcrete
47.4	?		33.9	29.88	12.9	3	4	tip missing	20.3	quartzite
59.48	72.31	18.19	27.21	26.5	10.26	7	5	base missing	15.9	quartzite
42.47	?		25.99		10.86	7	4	mid-fragment only	15.9	silcrete
22.23	?	16.05				7	8	tip only	1.9	silcrete
21.56	?		24.41		7.7	7	5	mid-fragment only	5.1	silcrete
32.63	?		23.88		9.07	7	5	mid-fragment only	9.3	silcrete
42.18		17.54	29.71	22.39	8.38	5	4	irregular biface	9.2	silcrete
16.27	?		20.86		6.89	7	5	mid-fragment only	2.9	silcrete
40.56	?		23.22		10.72	7	4	tip or base only	9.5	quartzite
51.27	65.01	14.11	20.86	22.46	8.21	7	5	base missing	11.2	quartzite
41	43.83	12.79	19.73	20.55	9.95	6	5	tip missing	8.5	silcrete
22.91	?	14.62				7	7	tip only	1.9	silcrete
37.45	?		23.52	19.17	8.24	3	5	tip missing	8.4	quartzite
20.84	?		19.43		6.54	7	5	mid-fragment only	2.8	silcrete
31.64	?		28.51		8.86	7	6	mid-fragment only	10.4	silcrete
32.06	?		21.75	20	8.06	4	5	tip missing	6.7	silcrete
30.33		12	16.02	16.01	5.53	5	6	irregular biface	2.8	silcrete
37.05	?		18.81		9.16	7	3	mid-fragment only	7.5	quartzite
37.79	?		32.24		11.75	7	5	mid-fragment only	16.3	silcrete
36.53	?		19.17	15.99	5.88	4	6	tip missing	5.3	quartzite
30.41	?	11.64	19.13		7.23	7	4	base missing	4	quartzite
16.71	?					4	5	base only	1.5	silcrete
47.84	56.09	16.33	21.34	19.75	8.83	7	6	base missing	10.7	quartzite
34.35	?		18.54	16.74	6.45	3	4	tip missing	4.3	silcrete
34.88		17.65	20.86	21.18	9.91	6	4		7.7	silcrete
16.26	?		22.1		7.9	7	5	mid-fragment only	3.3	silcrete
21.12	?			19.84		5	7	base only	2.7	silcrete
30.64	?		19.97		7.32	7	5	mid-fragment only	5.7	silcrete
34.56	?		26.51		9.5	7	3	mid-fragment only	10.6	silcrete

Table 5.4 (continued)

31.12	?		28.5		6.21	7	5	mid-fragment only	6.7	silcrete
25.97	?			19.05		4	5	base only	3.4	quartzite
27.28	?			18.53		4	6	base only	3.3	silcrete
49.1	?		26.44	26.19	6.98	7	5	uniface, tip and base missing	14.6	silcrete
10.89						4	6	base only	0.7	silcrete
54.78		18.8	23.54	21.9	6.24	6	3		10.7	silcrete
48.58	53.7	14.31	17.31	17.01	6.37	5	4	tip missing	6.2	silcrete
45.52	59.96	16.08	16.52	12.35	5.58	4	4	tip missing	5.5	silcrete
79.46		20.62	25.28	21.37	11.55	4	4		21.6	quartzite
60.07		12.86	19.66	16.27	11.05	3	5	thick triangular cross-section	10.8	quartzite
80.94		22.04	27.96	23.59	7.18	3	6	repaired break near distal end	16.9	silcrete
74.81		20.44	24.78	22.54	9.99	4	5	repaired at and resharpened to near mid-length	16.5	silcrete
83.73	86.37	21.95	29.52	21.69	8.13	7	6	resharpened to near mid-length	20.4	quartzite
68.28		17.65	24.32	20.03	6.77	4	5	resharpened to near mid-length	13	quartzite
69.67		23.98	25.84	23.54	8.38	3	6	pot-lid?, resharpened to near mid-point	15.8	quartzite
72.29	84.08	27.07	34.38	32.99	13.05	7	5	uniface, base missing	31	silcrete
53.22		15.69	19.01	15.52	7.91	3	5	resharpened to near mid-length	7.3	silcrete
47.08		19.51	22.92	19.33	8.21	3	5		9	quartzite
48.02	51.61	14.59	22.1	22.28	11.34	7	4	base missing	10.7	quartzite
69.71	72.26	20.29	22.14	19.1	14.63	4	4	tip missing	19.6	quartzite
65.15	67.92	22.4	24.86	23.25	10.04	5	4	tip missing	16.5	quartzite
47.35	51.7	14.24	17.52	14.73	5.95	7	5	tip and base missing	5.2	quartzite
57.21		13.04	20.32	17.56	7	4	3		8.2	quartzite

Table 5.4 (continued)

39.91		18.24	22.51	20.42	7.25	5	4	flat base	7.6	quartzite
30.54		13.76	17.2	11.31	8.73	7	4	nub of a biface	4.1	red quartzite
53.12		18.44	21.82	15.58	6.97	2	4	base reworked into shouldered point	8.8	quartzite
68.26		22.39	27.77	25.64	12.32	4	3	point appears unfinished	24.1	red quartzite
56.2		15.13	20.18	16.32	9.32	5	4	base nearly flat	9.5	quartzite
47.69		18.41	21.19	19.75	8.38	3	4		8.2	silcrete
30.71		10.94	14.09	12.87	6.01	4	5	tiny complete point	2.8	silcrete
51.24	54.22	19.8	25.73	16.04	12.51	3	3	tip burinated	13.3	quartzite
46.07	?	19.01	23.63	24.05	11.45	7	3	base missing	13.1	silcrete
47.84		17.94	24.33	31.27	10.17	6	4		13.6	silcrete
57.91	66.2	17.27	26.93	22.86	14.85	7	3	unfinished, base missing	17	silcrete
59.86	76.99	22.48	34.68	33.67	16.07	7	4	unfinished, base missing	34.5	quartzite
79.72	84.5	17.36	27.58	26.22	9.85	7	4	unfinished, base missing	29.1	quartzite
51.28	65.25	19.93	26.43	30.97	7.82	7	4	base missing	13	quartzite
33.97	?		28.99		9.13	4	4	base only	8.1	quartzite
35.32	?		22.22	19.17	7.32	4	5	base only	5.8	silcrete
46.54	62.69	23.46	30.4	22.67	9.64	4	3	tip missing	17.9	silcrete
37.06	?		23.14	20.58	9.24	7	3	mid-fragment only	9.4	quartzite
37.86	?		31.69	25.9	18.66	5	2	unfinished, tip missing	21.4	quartzite
41.29	?		33.58	22.49	8.4	2	3	base only	12.3	quartzite
41.96	?		34.83	36.55	11.1	5	3	base only	20.9	quartzite
67.63	?	26.72	38.76	37.53	15.23	7	3	unfinished, base missing	46.9	quartzite
64.75	?		44.92	36.26	18.39	4	3	unfinished, tip missing	57.4	quartzite
50	62.07	15.33	21.28		8.12	7	5	base missing	8.3	silcrete
34.85		15.99	22.54		7.32	7	4	base missing	5.3	silcrete

Table 5.4 (continued)

63.98	?		45.01	34.38	18.34	4	3	unfinished, tip missing	50.7	quartzite
29.72	?	16.97			7.06	7	5	tip only	3.9	silcrete
16.89	?	12.02			4.23	7	4	tip only	0.8	silcrete
22.99	?	16.73			5.46	7	4	tip only	2.1	quartz
12.48	?			14.24	5.47	4	4	base only	0.8	silcrete
14.92	?			22.14	6.89	3	2	base only	2.1	quartzite
52.79	70.26		28.41	22.76	10.97	4	4	tip missing	17.5	quartzite
38.2	?		27.93	23.56	13.71	5	3	unfinished, tip missing	15.9	quartzite
21.64	?	25.18			4.29	7	4	tip only	2	silcrete
32.46	?	12.63	18.03		6.47	7	4	base missing	4	silcrete
20.49	?	19.16			7.44	7	4	tip only	2.4	quartzite
27.01	?			22.01	8.17	4	5	base only	4.9	silcrete
81.86	?	30.65	43.9	30.07	23.21	7	2	unfinished, base missing	84	quartzite
56.66	?		34.15	23.72	12.65	3	4	unfinished, tip missing	21.6	silcrete
32.71	?		23.16	16.29	7.16	4	4	tip missing	5.9	silcrete
15.76	?			15.75	6.97	3	3	base only	1.6	quartzite
64.23	?	34.9	38.94	32.9	21.21	3	3	unfinished, tip missing	50.7	quartzite
43.95	?		26.19	24.71	9.03	3	3	unfinished, tip missing	12.2	quartzite

Table 5.5: Cape Hangklip bifacial points.

Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/base	scar density	comments	weight	Raw material
137.27		27.57	33.14	28.05	14.08	2	5	hafted area from 64mm up from base, very nice point, resharpened with no bevel, wind polished, labeled "Cape Hangklip" and "16", from museum display	65.7	fine gray silcrete
126.02	149.77	31.9	42.09	40.43	16.33	7	4	from museum case, base missing, wind polished	95.7	fine gray silcrete
137.2	180	38.34	50.35	38.05	15.56	7	3	tip and base missing, heavy sand abrasion	166.7	gray silcrete
78.54	?	34.59	52.4		16.01	7	4	broken fragment reworked into scraper?	50.9	gray silcrete
100.45	104.8	32.18	42.59	33.8	16.45	4	4	impact fracture on tip, heavy wind abrasion	63.7	fine gray silcrete
105.26		26.55	35.73	28.11	14.06	3	3	wind abraded	49.2	light gray silcrete
119.32	132.53	33.33	41.59	33.05	14.94	7	4	base missing, heavy wind abrasion	77.5	light gray silcrete
78.4	90.51	25.44	29.75	26.25	9.69	7	6	resharpening bevel, haft at midpoint, base and tip missing	27.3	fine gray silcrete
61.59	?	21.62	26.89		9	7	5	impact fracture on tip, base missing	17.6	fine gray silcrete
57.83		18.56	26.07	22.12	10.35	4	5		15.4	quartz
73.87	79.66	17.42	26.68	22.1	10.5	7	5	2 pieces refit, manufacturing break at midpoint	23.2	quartz
87.31	94.1	28.71	39.09	28.36	13.01	7	5	base missing, heavy wind abrasion	46.2	gray silcrete
79.26	90.41	24.8	33.67	30.29	10.6	7	4	base missing	30.6	gray silcrete

Table 5.5 (continued)

67.89	?	21.25	34.47	34.52	10.57	7	4	base missing, heavy wind abrasion	29.6	gray silcrete
73.04	86.17	19.88	25.44	20.86	9.59	2	6	tip missing	20.2	fine gray silcrete
40.67	47.51	15.35	19.67	17.01	8.41	7	3	base missing, heavy wind abrasion	7.1	light gray silcrete
93.66	119.39	32.23	46.99	41.04	11.7	4	4	tip missing	67.2	gray silcrete
50.11	?		25.82	22.48	13.03	4	5	tip missing	20.6	gray silcrete
45.31	?		24.27	20.88	9.05	4	5	tip missing	12	gray silcrete
44.12	50.3	17	21.93	18.98	9.68	4	4	impact fracture on tip, heavy wind abrasion	8.4	light gray silcrete
68.18	77.5	19.85	25.56	22.27	6.97	7	5	base missing,wind abrasion	14	fine gray silcrete
46.53	?		33.14	28	9.65	4	3	tip missing, wind abraded	18.6	gray silcrete
53.49	?		37.47	32.63	8.02	7	4	tip and base missing	22.2	gray silcrete
100.7		41.56	41.71	46.84	36.17	5	3	chunky biface	158.1	gray silcrete
62.77	73.47	30.14	47.58	43.54	24.52	5	4	chunky biface	71.2	gray silcrete
37.66	?		37.66	31.32	15.69	4	3	chunky biface, tip missing	27.6	gray silcrete
43.68		19.6	27.51	26.91	14.05	5	3	chunky biface	19.5	gray silcrete

Table 5.6: Cape Hangklip unifacial points.

Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/base	scar density	comments	weight	Raw material	Bulbar thinning?	Bifacial tip?
69.3	72.35	17.44	23.43	16.42	8.25	7	5	base missing, wind abraded	14.6	tan silcrete	yes	yes
68.1		25.76	36.56	34.05	8.68	6	5		25.3	fine gray silcrete	yes	no
63.36	?		47.14	27.67	10.57	6	6	tip missing, wind abraded	37.8	fine gray silcrete	no	n/a
49.38		19.76	30.7	29.52	11.46	6	5	wind abraded	16.6	fine gray silcrete	no	no
32.91	?	22.5			9.64	7	5	tip	9.2	tan silcrete	n/a	yes
59	64.42	20.24	30.61	23.47	9.45	4	5	impact fracture, wind abraded	19.5	fine gray silcrete	yes	n/a
49.09	?	19.39	27.18		9.86	7	3	base missing, wind abraded	15.6	fine gray silcrete	n/a	yes
34.11	?	20.19			4.48	7	5	base missing, reworked into scraper	4.2	fine gray silcrete	n/a	yes
49.39	56.73	20.19	24	21.64	7.15	6	5	impact fracture	10.5	fine gray silcrete	yes	n/a
61.4	?	29.39	43.32	35.18	17.03	6	2	tip missing, wind abraded	53	gray silcrete	yes	n/a

Table 5.7: Bifacial and unifacial points from Hollow Rock Shelter.

Unit	Level	ID	Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/ base	scar density	comments	weight	Raw material
AD14	IB	R52	26.51	?					7	5	tip or base only, unable to tell	4.8	fine quartzite
AD14	IB	R53	43.68	60.35	18.32	22.15	16.58	7.59	7	6	tip and base missing	7.9	fine quartzite
AC14	surface	R1	52.98		21.68	27.29	20.31	14.21	3	4	chunky, not finished, multiple steps, cobble cortex still visible on 60% of one face	19.6	silcrete
AC16	IIA	R255	37.19	?		26.49		9.72	7	3	tip and base missing	10.5	quartzite
AD15	IA	R225	107.41	111.34	30.28	42.88	35.76	18.22	1	8	bevelled retouch on tip end, hafted element seems more than half of length	65.7	silcrete
AD15	IA	R229	76.8	79.68	19.5	26.58	24.81	9.61	2	4	resharpened end seems less than half of length	18.2	quartzite
AB14	IA	R186	40.84	?	16.22	23.47		7.52	7	5	base missing	7.9	silcrete
AD13	IA	R289	9.06	?					7	?	tip only	0.3	silcrete
AD11	I	R214	40.51	?	15.86	22.47		6.55	7	6	base missing	5.2	fine quartzite
AD15	IB	R250	46.47	56.29	13.51	20.56	19.84	8.62	7	5	base missing	8.2	quartzite
AD15	IB	R251	43.14	?		25.36		9	7	5	tip and base missing	10.4	quartzite
AD15	IB	R252	38.57	57.83	15.82	20.69	20.45	7.85	7	5	tip and base	7.1	quartzite

Table 5.7 (continued)

											missing		
AD13	IA	R287	39.32	?	19.8	29.01		8.14	7	5	tip and base missing	11.5	quartzite
AD13	IA	R288	56.74	61	21.3	28.62		13.42	7	5	base missing	19.1	quartzite
AD13	IA	R285	28.59	?	14.12	24.38		6.81	7	6	base missing	4.6	silcrete
AD13	IA	R284	31.91	?	12.69	20.47		5.88	7	7	base missing	3.7	fine quartzite
AD13	IA	R286	29.73	?		18.6		5.93	7	6	tip or base only, unable to tell	3.2	silcrete
AD13	IA	R290	34.07	?		26.47		9.34	7	5	tip or base only, unable to tell	8.3	quartzite
AD13	IA	R279	28.29	?					7	6	tip or base only, unable to tell	3.4	silcrete
AD16	IIA	R303	50.26	58.05	12.72	17.01	16.35	6.32	7	7	base missing	6.1	silcrete
AC14	IB	R207	87.25	102.61	30.1	41.24	36.54	15.53	4	5	tip missing	53.2	quartzite
AC14	IB	R209	66.73		16.13	21.12	16.25	7.71	4	5	tip has been reattached	10.3	quartzite
AC14	IB	R215	59.29	71.05	16.1	19.03	15.54	7.45	7	4	tip and base missing	9.9	silcrete
AD13	IB	R297	24.48	?					7	5	tip or base only, unable to tell	3.3	quartzite
AD13	IB	R292	22.35	?					7	4	tip or base only, unable to tell	3.1	quartzite
AD13	IB	R291	20.08	?		21.13		7.38	7	4	tip and base missing	4	quartzite
AD16	I	R302	63.98	70.28	16.75	21.77	18.36	7.49	3	8	tip and base missing	11.8	silcrete
AD16	I	R301	43.85	?	13.65	19.47		6.85	7	5	base missing	6.3	silcrete
AD14	IA	R3	42.95	?		24.16		8.47	7	5	multiple steps, tip and base missing	8.5	quartzite
AD14	IA	R4	32.08	?		23.45		7.93	7	4	tip and base missing	6.3	silcrete

Table 5.7 (continued)

AD16	IA	R333	37.63	?		17.16		6.72	7	7	uniface	4.1	silcrete
AD16	IA	R167	39.75	?		18.82	18.81	8.42	4	4	tip missing	7.9	quartz
AF12	surface	R266	71.82	?	35.81	43.3	35.71	18.44	7	6	tip and base missing	79.2	silcrete
AD12	I	R141	33.87	?		24.27		5.92	7	7	tip only	4.4	silcrete
AD12	I	R144	26.44	?					7	4	unidentifiable fragment	3.6	silcrete
AD12	I	R143	27.56	?		26.98		10.68	7	5	tip and base missing	7.6	silcrete
AD12	I	R147	44.17	52.06	18.8	23.71	19.65	5.19	7	7	uniface, base missing	6	silcrete
AD12	I	R142	33.45	?		24.71		11.34	7	3	tip and base missing	10.6	silcrete
AC14	IA	R203	61.81		16.17	22.23	19.19	8.18	4	7		11	silcrete
AC14	IA	R189	70.4		20.56	30.48	24.88	9.84	3	5	bevelled retouch on tip end, hafted element seems more than half of length	19.4	silcrete
AC16	surface	R204	43	?	17.54	25.86		9.09	7	5	base missing	9.4	silcrete
AD14	II	R102	27.54	?	12.91				7	6	tip only	2.1	silcrete
AD15	IA	R152	48.78	?		23.35		10.39	7	5	tip and base missing	13.2	silcrete
AC16	IA	R262	37.66		8.55	13.37	11.28	5.47	2	6		2.6	quartz
AD14	IB	R278	31.93	39.65	11.47	16.85		6.54	7	6	base missing	3.2	quartz
AC16	IA	R212	30.34	?			26.77		3	4	base only	8.2	quartz

Table 5.8: Bifacial and unifacial points from Kleinjongensfontein.

ID	Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/base	scar density	comments	weight	Raw material
D197	61.97	65.2	23.23	31.43	26.58	12.56	4	7	impact fracture on tip	27	brown chert
D297?	59.58	67.81	19.08	25.59	28.11	10	7	5	base missing	18.6	tan silcrete
4590	54.11	62.86	22.75	26.95	24.89	8.04	7	6	base missing	12.8	red-grey silcrete
?	65.96	70.86	25.82	30.67	23.75	6.91	3	6	impact fracture on tip	16.8	ironstone
4697	69.11		20.62	31.54	20.71	9.78	4	6	beveled retouch	20.8	tan silcrete
?	53.06	?		27.2	20.78	8.04	4	6	tip missing	14.9	tan silcrete
?	58.16	69.1	19.39	22.79	20.51	9.45	4	5	impact fracture on tip	15.3	red-tan silcrete
4467	37.52	?			32.58	6.08	3	6	base only	8.8	chalcedony
D198	58.09	69.31	15.76	23.08	21.45	7.94	7	5	base missing	13.7	red-tan silcrete
?	56.76	?	29.26	30.04	23.71	10.11	7	4	uniface, tip and base missing	22.1	tan silcrete
??08	49.39	?	22.58	31.28	28.94	9.97	7	5	tip and base missing	18.1	red-tan silcrete
?	65.11	?	19.64	24.29	20.32	8.31	7	6	tip and base missing	20.2	grey silcrete
4695	28.15	?		24.59		7.33	7	4	tip and base missing	7.9	tan silcrete
4699	63.22	?	26.08	32.42	22.92	12.62	7	4	tip and base missing	29.7	quartzite
4694	34.37	?	16.87			7.35	7	5	tip only	5.3	tan silcrete
4664	39.17	?	21.99			9.51	7	5	tip only	9.1	quartzite
466?	42.37	?	15.24	19.76	19.71	7.57	7	4	uniface, tip and base missing	8.2	tan silcrete
?	63.04	70.25	21.8	30.06	28.84	8.79	5	4	uniface, tip missing	19.5	tan silcrete
?	62.93	?	21.16	25.07	23.03	8.02	3	5		13.2	red silcrete
?	83.35		19.36	24.25	22.69	8.48	7	5	base missing	17.5	grey silcrete
?	63.19		21.46	24.1	20.4	8.46	4	6	haft only 1/4 of length	13.2	tan silcrete
?	84.15	101.38	22.55	29.17	25.27	10.16	7	5	base and tip missing	31.5	tan silcrete

Table 5.9: Peers Cave bifacial and unifacial points.

Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/base	scar density	comments	weight	Raw material
89.83		21.15	26.04	23.09	11.74	2	6	plano-convex cross-section, haft nearly half-way up	23.4	fine grey silcrete
55.67	94.87		31.32	26.57	9.1	7	6	tip and base missing	21.7	fine tan silcrete
42.97	?	19.99			9.46	7	5	tip only	9.5	fine tan silcrete
44.72	?	24.67			9.34	7	6	tip only	10.6	fine red silcrete
28.34	?			26.59	11.97	4	5	base only	8.3	fine red silcrete
26.76	?	15.52			5.41	7	6	tip only	1.9	fine tan silcrete
35.99	?	19.78			8.19	7	5	tip only	5.7	fine tan silcrete
31.72	?			22.82	8	2	6	base only	5.7	fine grey silcrete
47.97	?		31.17	22.77	8.77	3	5	base only, possible mastic residues on base	13.2	tan quartzite
102.5		29.93	37.85	36.86	11.87	6	5	uniface	49.3	fine tan silcrete
39.82	?			32.54	7.96	6	6	uniface, base only	15.4	fine tan silcrete
50.26	77.83	21.54	29.32		8.92	7	6	base missing, clear haft	13.7	fine tan silcrete
41.98		17.32	21.53	18.6	8.34	4	4	pietersburg shape	7.3	fine tan silcrete
43.73		11.39	15.57	14.41	5.28	4	4	pietersburg shape	3.5	fine tan silcrete
35.07		9.91	12.47	11.54	4.03	3	4	pietersburg shape	1.9	fine tan silcrete

Table 5.10: Miscellaneous Still Bay bifacial points.

Site	ID	Length	Estimated Length	Top third width	mid width	bottom third width	mid thickness	hafting element/base	scar density	comments	weight	Raw material
Blombos Bo	D 207	167	200	37.23	48.79	46.91	8.47	7	5	collected by Heese, donated to SAM by HJ Deacon 22/11/01, extreme tip and base missing	87	very fine mottled gray silcrete
unknown Cape	Φ	106.65	108.33	28.45	41.13	39.81	11.55	3	4	collected by JM Bain, extreme tip missing	48.9	very fine tan silcrete
Elandsfontein	8510	121.61		24.9	32.58	28.52	13.12	6	5	collected 16/9/73 by R.G. Klein, tip broken in bag, base may not be platform, may be broken and reused.	53.5	mottled coarse silcrete
North of Clanwilliam	8846	65.79	?	24.62	27.44	26.27	8.34	7	5		22.5	fine tan silcrete
Hangklip West	HKW 7429	69.78	90	26.76	30.06	27.86	10.26	7	5	surface collected, resharpened to middle of point, bevelling retouch apparent	30	mottled gray-orange silcrete
Peers Shelter	B/102	66.5	87.36	21.15	26.09		12.83	7	3	contact with implement layer, unfinished point	24	grey quartzite
Elandsfontein	EFT	88.59		23.05	32.61	21.84	13.6	1	3	collected by Jolly	36.5	tan-red quartzite

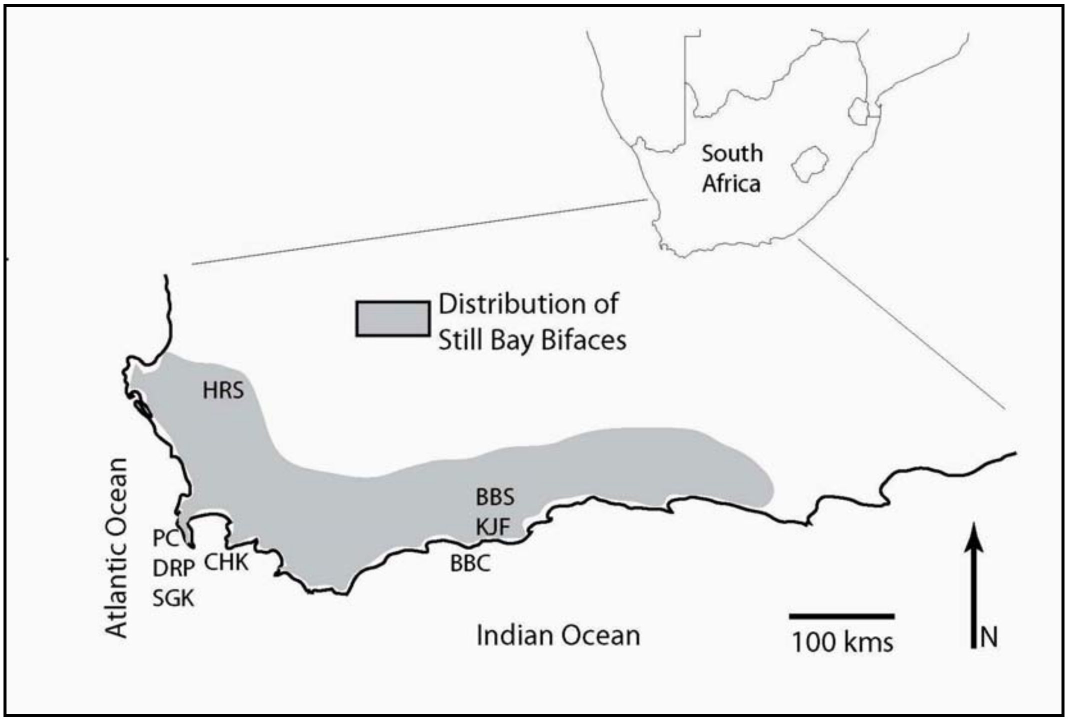

Figure 5.1: Map of southern Cape with Still Bay sites discussed in this chapter and the distribution of Still Bay bifacial points marked. Hollow Rock Shelter (HRS), Peers Cave (PC), Dale Rose Parlour (DRP), Skildergatkop (SGK), Cape Hangklip (CHK), Blombos Cave (BBC), Blombos Sands (BBS), and Kleinjongensfontein (KJF).

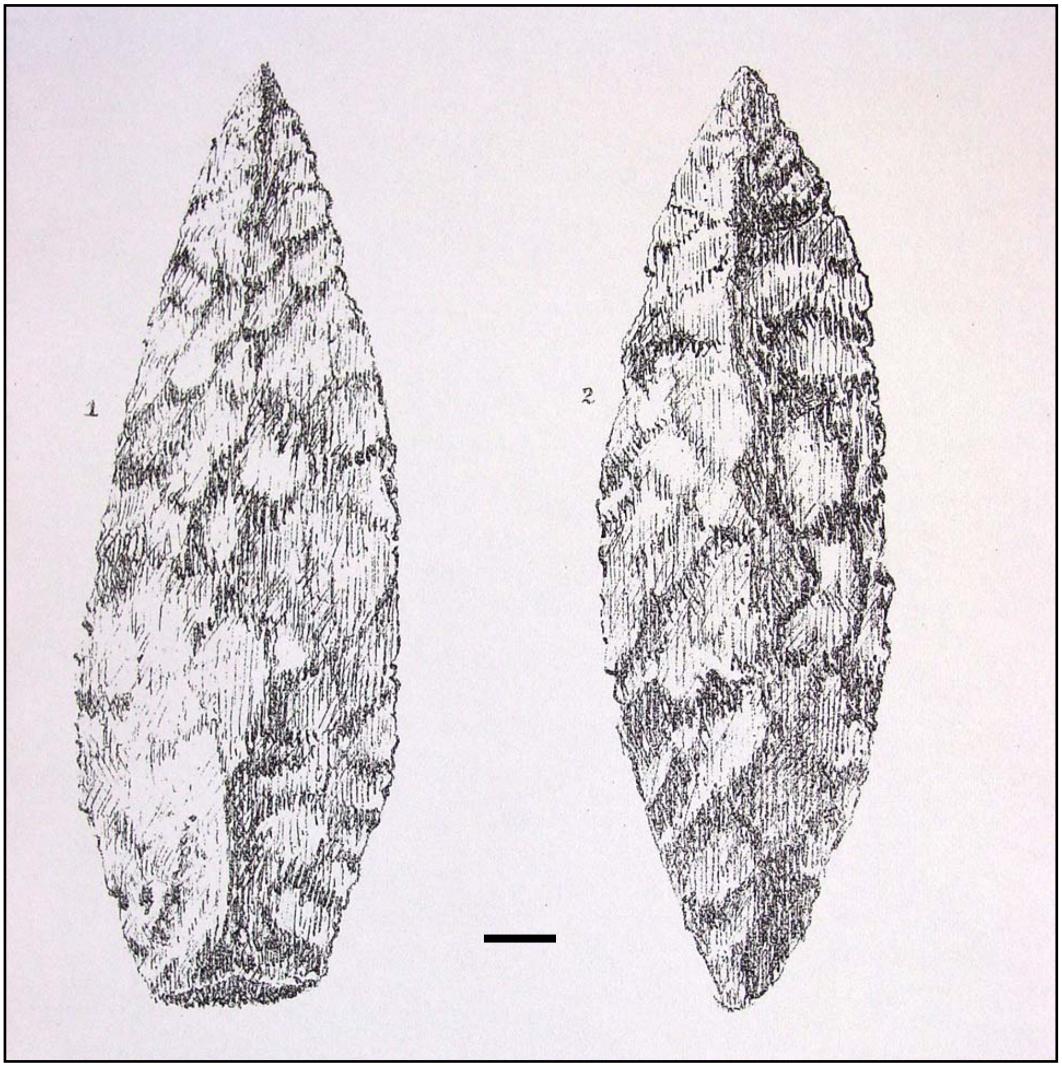

Figure 5.2: Illustration from Dale (1870) showing Still Bay bifacial points (1, 2) as part of the Cape Flats Culture. Bar is 1 cm.

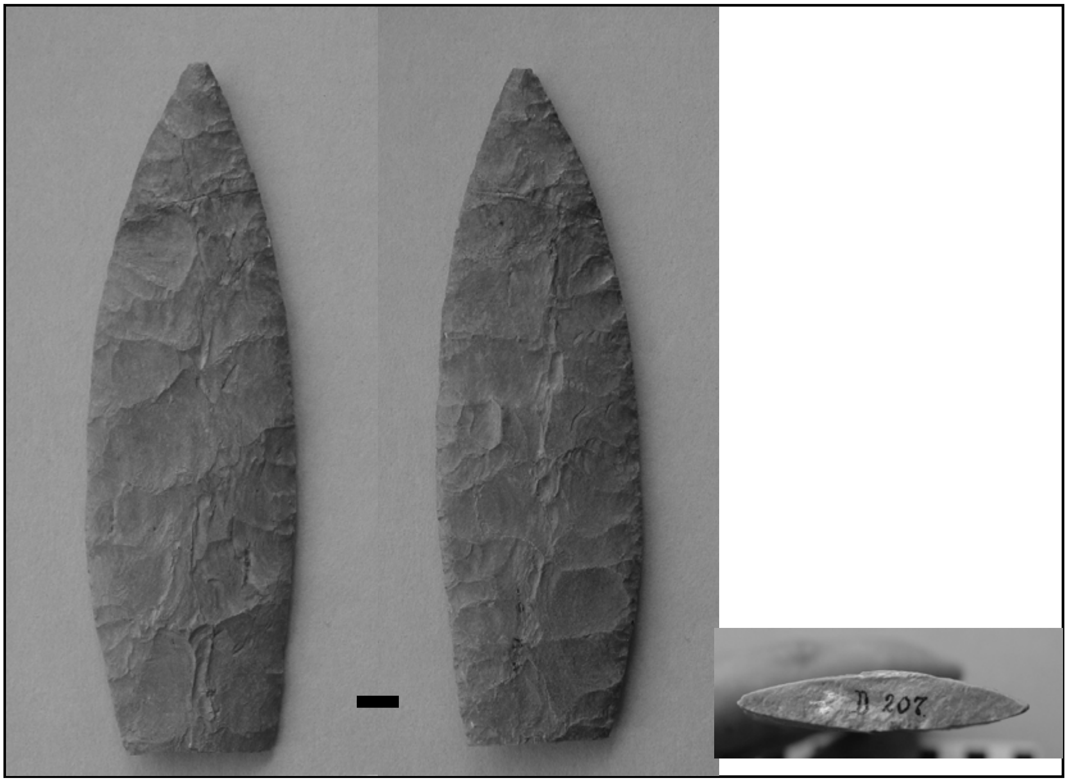

Figure 5.3: The large Still Bay bifacial point collected by Heese at the Blombos Schoolhouse site known as the Blombos Bo. Bar is 1 cm.

Figure 5.4: Bone point from the Heese collection of the Still Bay dune site of Blombos Sands. Bar is 1 cm.

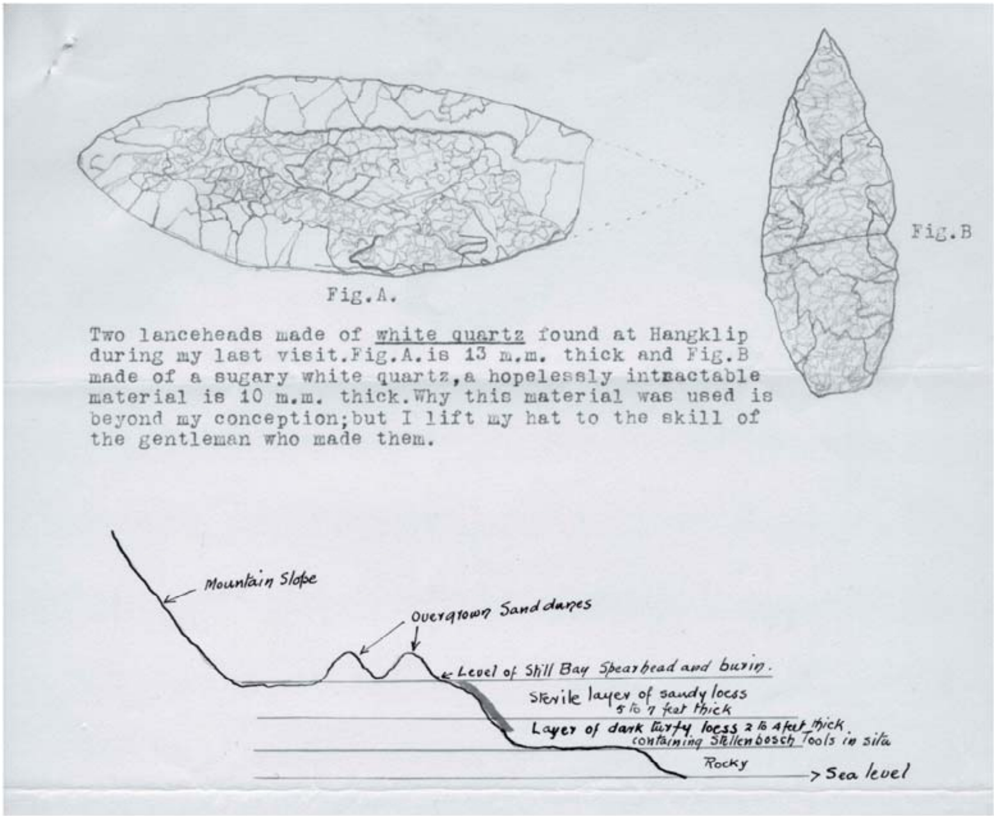

Fig.A.

Fig.B

Two lanceheads made of <u>white quartz</u> found at Hangklip during my last visit.Fig.A.is 13 m.m. thick and Fig.B made of a sugary white quartz,a hopelessly intmactable material is 10 m.m. thick.Why this material was used is beyond my conception;but I lift my hat to the skill of the gentleman who made them.

Figure 5.5: Profile from Malan's letter to Heese of the Still Bay site at Cape Hangklip. Heese papers at Iziko: South African Museum.

Figure 5.6: Aerial photographs of Cape Hangklip (World War II era) from the papers of Gatehouse on file at Iziko: South African Museum, Cape Town. Note the open and active sand dunes over much of the area at that time.

Figure 5.7: Small surface exposure of ESA site at Cape Hangklip, R. Yates for scale. Note heavy brush in background.

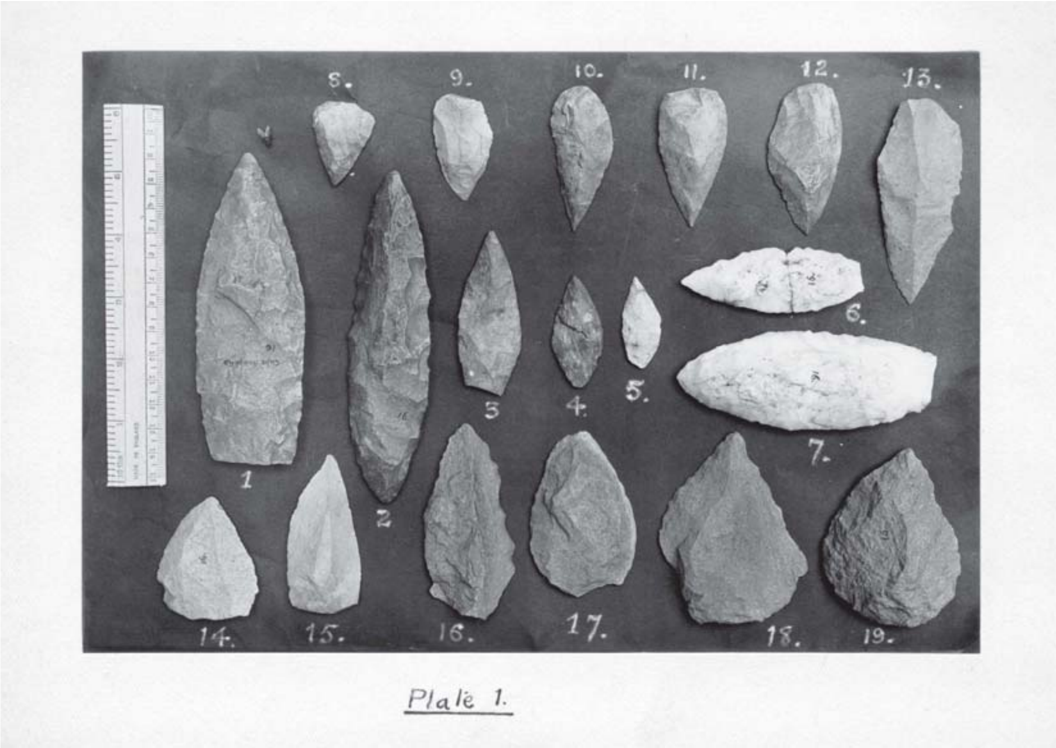

Figure 5.8: Still Bay artifacts from Malan's collection at Cape Hangklip. Artifact labeled "7" is only one missing. From the Heese papers at Iziko: South African Museum.

Figure 5.9: Frans Malan's plate of a worked ochre pencil from the Still Bay site at Cape Hangklip. Location of this artifact is currently unknown. From the Heese papers at Iziko: South African Museum.

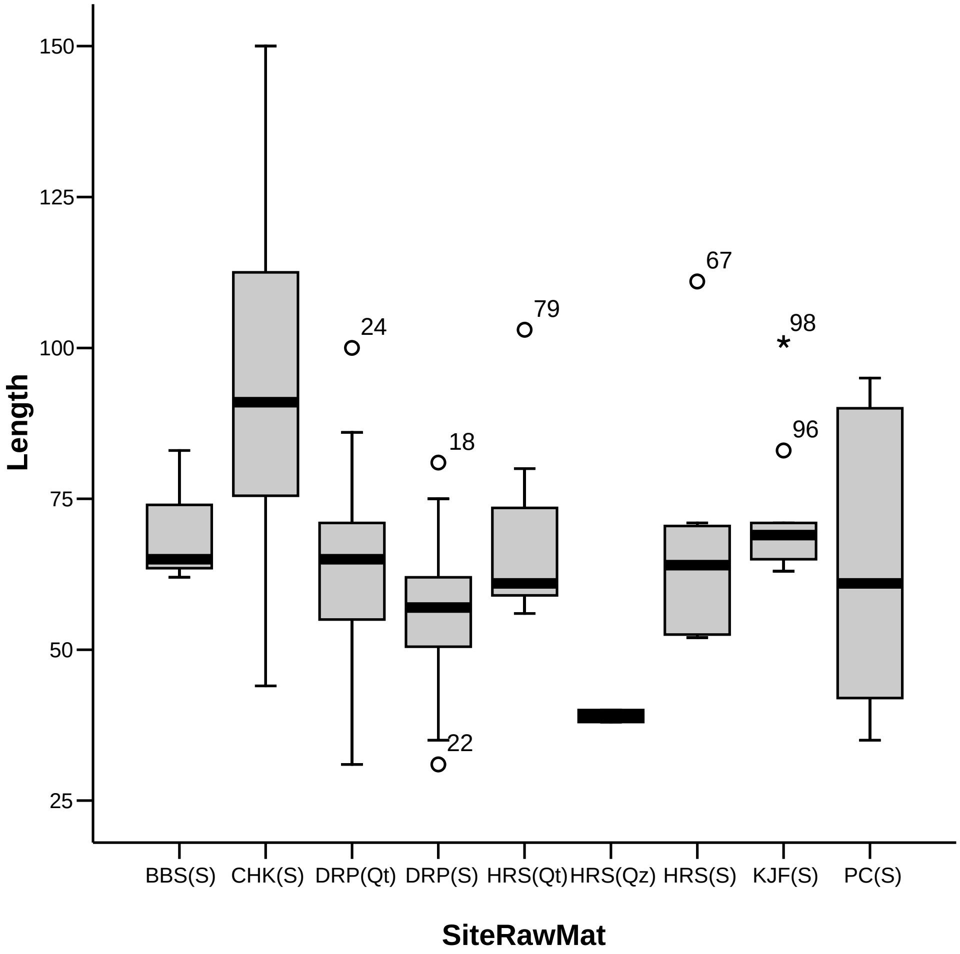

Figure 5.10: Boxplots for the lengths or estimated lengths of all complete or nearly complete Still Bay points by site and raw material. BBS=Blombos Sands, CHK=Cape Hangklip, DRP=Dale Rose Parlour, HRS=Hollow Rock Shelter, KJF=Kleinjongensfontein, PC=Peers Cave, S=Silcrete, Qt=Quartzite, and Qz=Quartz.

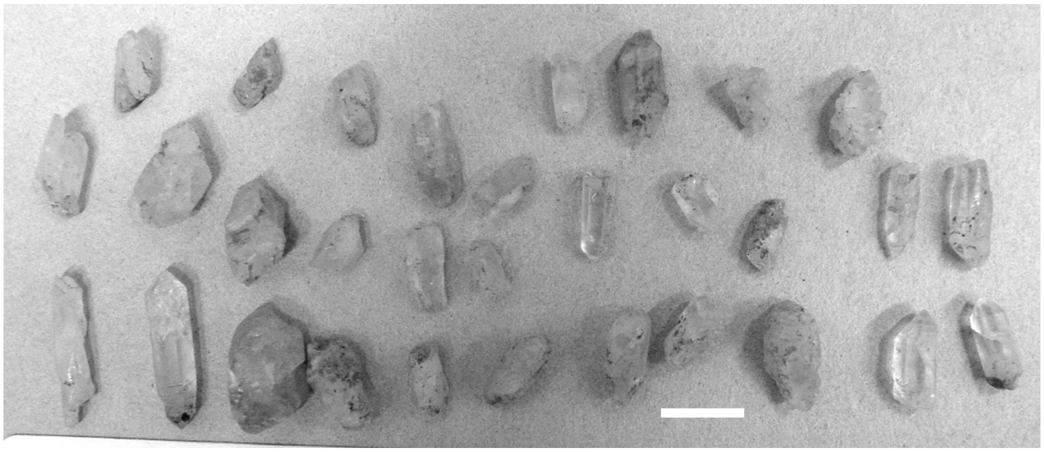

Figure 5.11: Unmodified quartz crystals from a single 1-meter square and 5-centimeter spit at Hollow Rock Shelter. Bar is 1 cm.

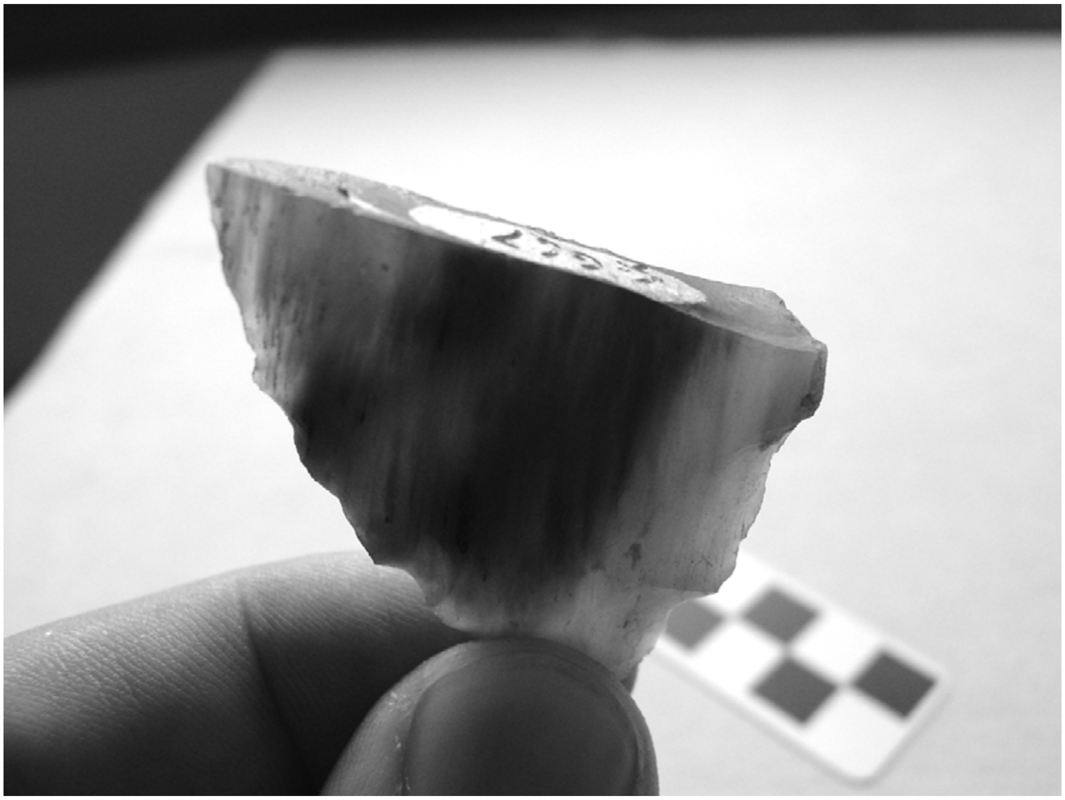

Figure 5.12: Base of chalcedony Still Bay point from Kleinjongensfontein.

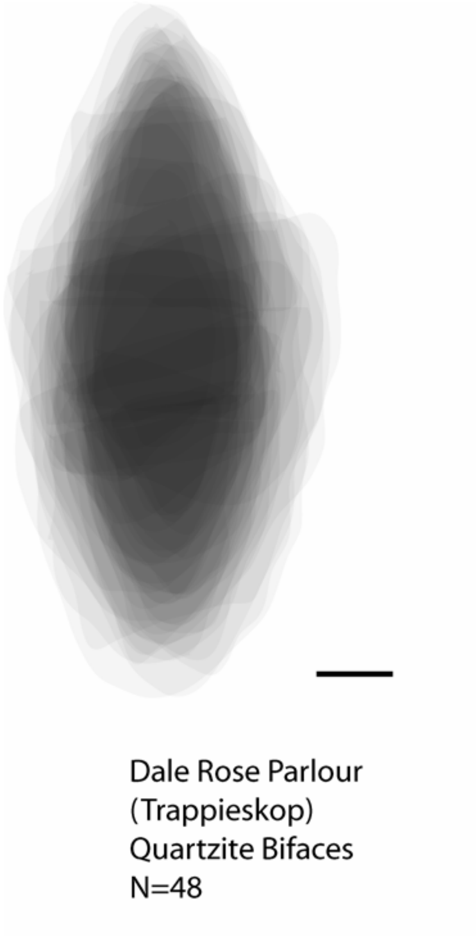

Figure 5.13: Composite images of quartzite Still Bay bifacial points from Dale Rose Parlour, 48 fragments, bar is 1 cm.

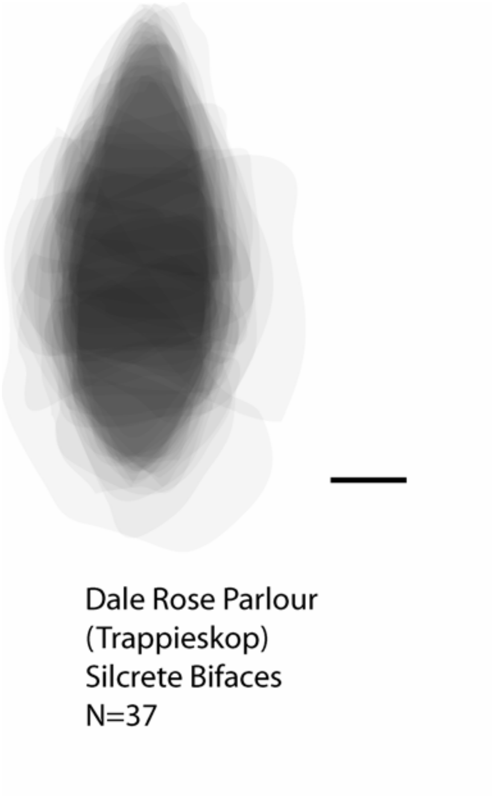

Figure 5.14: Composite images of silcrete Still Bay bifacial points from Dale Rose Parlour, 37 fragments, bar is 1 cm.

Figure 5.15: Composite images of quartzite Still Bay bifacial points from Hollow Rock Shelter, 14 fragments, bar is 1 cm.

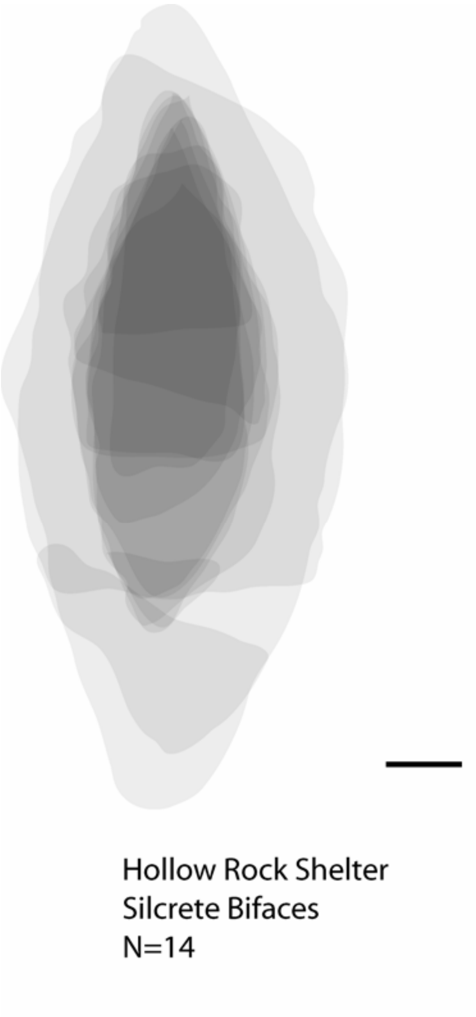

Figure 5.16: Composite images of silcrete Still Bay bifacial points from Hollow Rock Shelter, 14 fragments, bar is 1 cm.

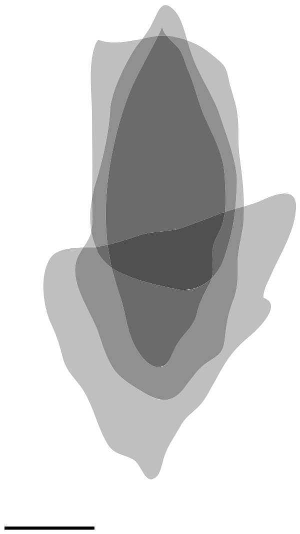

Figure 5.17: Composite images of quartz Still Bay bifacial points from Hollow Rock Shelter, 4 fragments, bar is 1 cm.

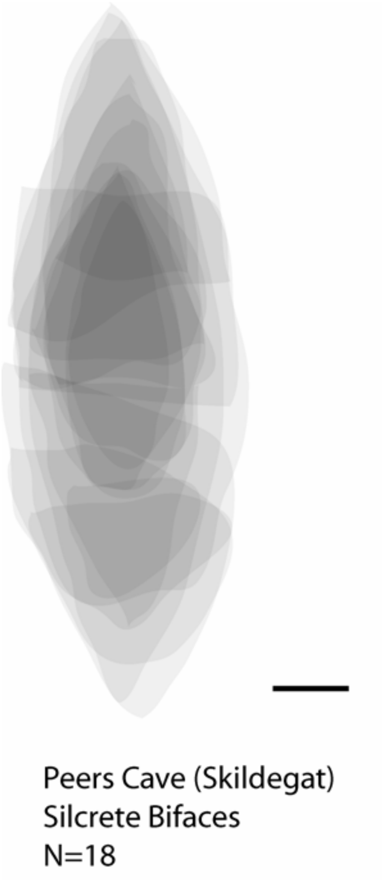

Figure 5.18: Composite images of silcrete Still Bay bifacial points from Peers Cave, 18 fragments, bar is 1 cm.

Figure 5.19: Composite images of silcrete Still Bay bifacial points from Kleinjongensfontein and Blombos Sands, 18 fragments, bar is 1 cm.

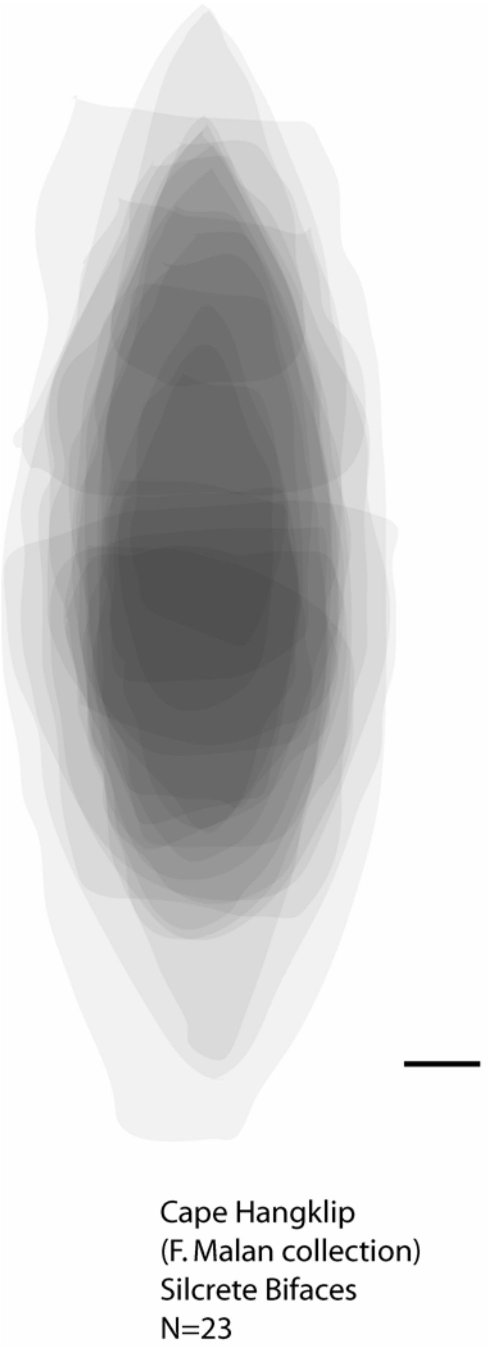

Figure 5.20: Composite images of silcrete Still Bay bifacial points from Cape Hangklip, 23 fragments, bar is 1 cm.

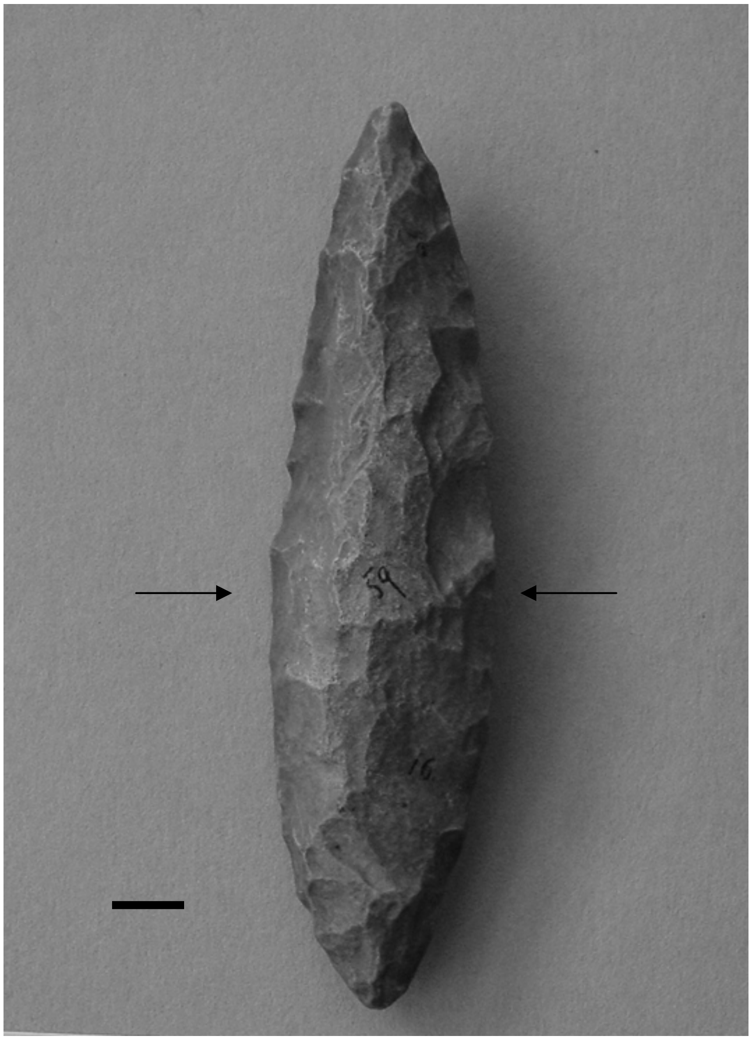

Figure 5.21: Still Bay bifacial point from Cape Hangklip with evidence of hafting. Bar is 1 cm.

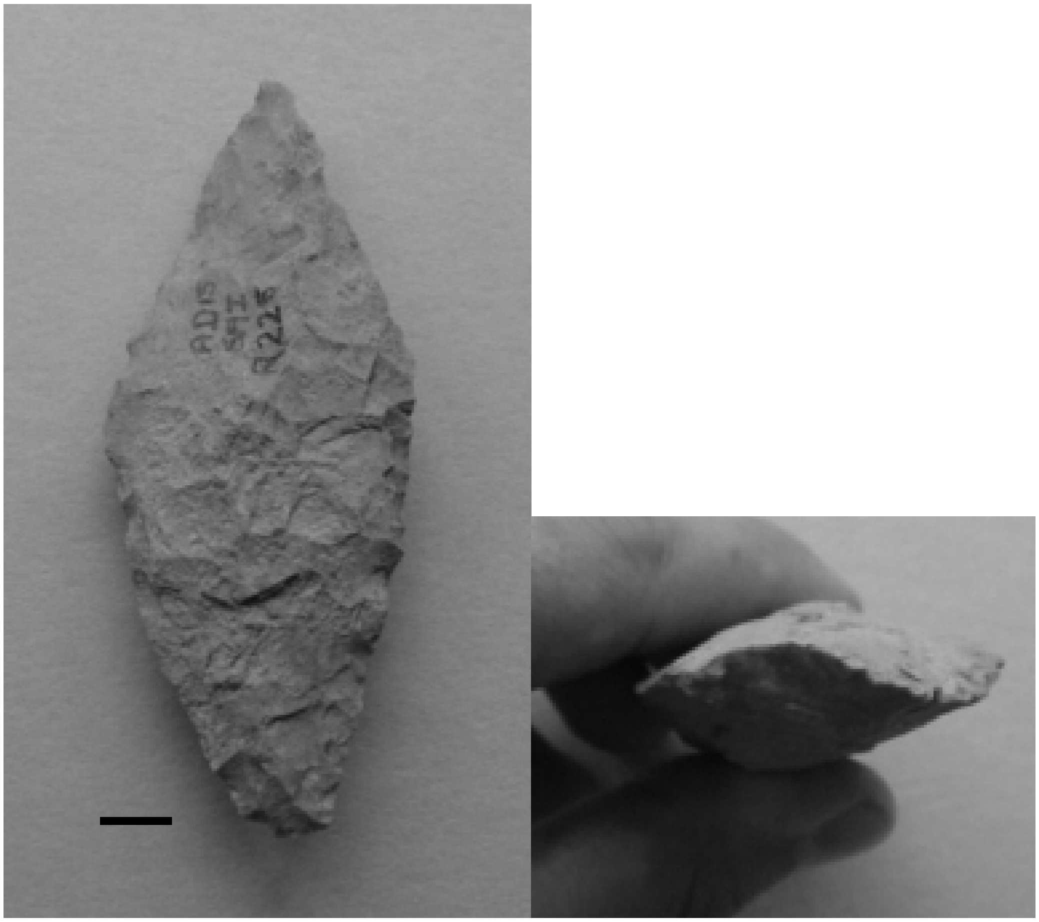

Figure 5.22: Still Bay bifacial point from Hollow Rock Shelter with robust haft and clear evidence of resharpening in while hafted. View on right shows beveling from resharpening looking down on the tip. Bar is 1 cm.

Figure 5.23: Silcrete Still Bay bifacial point from Kleinjongensfontein with impact fracture on the tip.

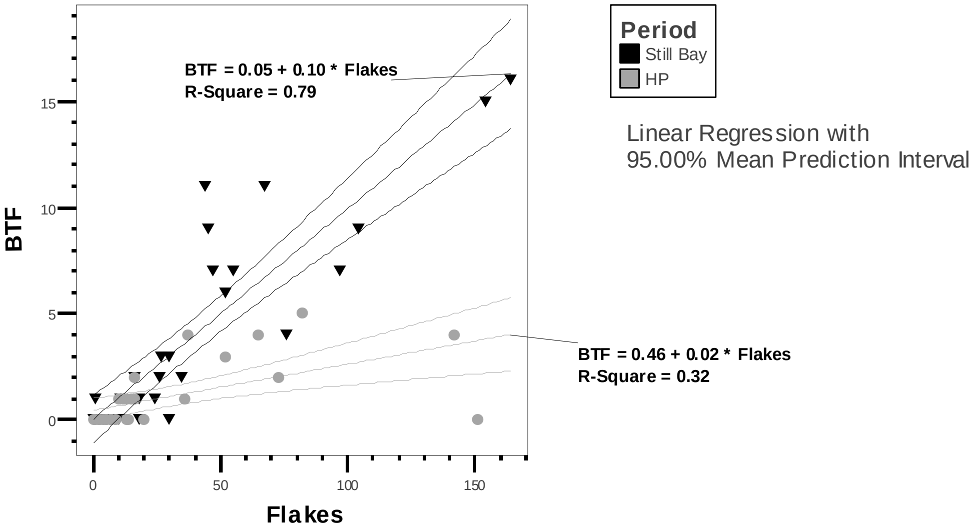

Figure 5.24: Scatterplot with regression lines and confidence intervals for bifacial thinning flakes among all silcrete flakes for Still Bay and Howiesons Poort assemblages.

Chapter 6: Additional Investigations of the Howieson's Poort Shelter Collections

This brief chapter presents the findings of some additional work on the collections from the Howieson's Poort shelter, the name-bearing site for the sub-stage and lithic industry of the MSA, housed at the Albany Museum in Grahamstown. The main focus of this chapter is the description of a single artifact, what that artifact means for MSA studies, and some suggestions to help solve the "unsolved mystery" of the nature of that site (J. Deacon 1995:110).

Purpose and Background of the Study

I began studying the Howieson's Poort shelter collections because I wanted a debitage sample for comparison to those from Still Bay assemblages. The Howieson's Poort collection was well-suited in that the relationship between the Howiesons Poort and Still Bay sub-stages are not fully resolved, the majority of the Howieson's Poort collections (those excavated by the Deacons) were excavated using fine stratigraphic control and screens, and a high percentage of the debitage is silcrete. It is also a site of historic importance in MSA archaeology and I wanted first-hand experience with the artifacts from it.

The Howieson's Poort shelter, located near Grahamstown in what is now the Eastern Cape Province of South Africa, was originally excavated by Stapleton and Hewitt in the 1920s (Figure 1.1). Their reports on that excavation (Stapleton and

Hewitt 1928, 1929) led to the recognition of other similar artifact occurrences in southern Africa and the application of the Howiesons Poort name as a type (Goodwin and Van Riet Lowe 1929, Clark 1959) and now a sub-stage of the MSA (Wurz 2002). The reports of their excavation lack much of the description of methodology and context that would be considered minimal today and their excavation notes at the Albany Museum today consist of a single page. Of the thousands of artifacts that they excavated only two small boxes remain in the collection of the museum. The whereabouts of the rest remains unknown. The site is not mentioned in British Museum listings (Mitchell 2002b), which suggests they may not have been dispersed to European museums – a fate that befell many other early collections from Africa. The surviving boxes contain almost exclusively retouched tools and other unusual artifacts, including some that were not excavated by Stapleton and Hewitt. It is the contents of these boxes that were the subject of numerous artifact illustrations in Janette Deacon's (1995) summary of the work at that site.

As J. Deacon (1995) described, there are a number of unanswered questions at the Howieson's Poort shelter that remain today. Hilary and Janette Deacon undertook a new excavation in 1965 in the hopes of addressing some of those questions, importantly the placement of the Howiesons Poort sub-stage in the MSA and dating (radiocarbon was still the only viable method at that time) of the site's deposits. Deacon and Deacon re-excavated the site in four five-foot squares through several layers of archaeological deposits. The general descriptions of those layers roughly corresponded to those of Stapleton and Hewitt but the artifacts recovered from them did not (J. Deacon 1995). In general, the backed pieces that made the site notable were all but absent from the Deacons' excavation. It is recorded that a single backed artifact came from the controlled excavations inside the shelter (J. Deacon 1995). The scree slope at the mouth of the shelter was also collected, providing the bulk of the artifacts in the collection today, but the relationship of these artifacts to the deposits in the shelter remains unclear. It was not known if these were the products of natural erosion, discards from Stapleton and Hewitt's work, or a combination of both. Either way, the materials from the scree slope *do* conform generally to the Howiesons Poort type.

For the purposes of my study I chose to look at all of the materials from a single five-foot square column. This would give me a sample with the thing that I needed most, stratigraphic control. I chose the column that was thought to be closest to Stapleton and Hewitt's original excavation and provided the most layers for analysis, square B4. I went through every bag containing artifacts from B4, regardless of the label on the bag. In a similar way to the Still Bay debitage I counted and weighed all of the silcrete flakes and small flaking debris and characterized the bifacial thinning flakes within that debitage. The pattern in the silcrete debitage (as discussed in the previous chapter) was clear. The debitage nearest the bottom of the excavated column was the most bifacial, nearly the same as for Still Bay assemblages, and that from near the top of the column lacked bifacial thinning flakes entirely.

An Alternative Interpretation

The nature of the assemblage excavated by Deacon and Deacon and its apparent differences from the Stapleton and Hewitt assemblage was the main "unsolved mystery" of the site (J. Deacon 1995:110). How could an assemblage from the name-bearing site not resemble the type-assemblage at all? I suggest that Stapleton and Hewitt excavated far more of the Howiesons Poort-bearing deposits than their scanty surviving documents show. Guided by available documents, the Deacons began excavations in the very reasonable belief that they were investigating deposits *equivalent* to those in the original Hewitt and Stapleton trench. An attempt at linking the two excavations directly with another trench was, however, unsuccessful (J. Deacon 1995:112). However, if Stapleton and Hewitt had dug away most, perhaps all of HP deposits in the shelter, that would explain the apparent evenness of the surviving deposit first observed by the Deacons. In this scenario, their meticulous and perfectly recorded excavations would have penetrated *beneath* the excavations of Stapleton and Hewitt. This would go some way to explain the difficulties they had in correlating their own very precise and clear layer descriptions with those described by the earlier excavators. This scenario would also go a long way to explaining the near total absence of artifacts of the Howiesons Poort type in the Deacons' assemblage, if it came from below the HP levels. The temporal trend in technological changes apparent in the silcrete debitage, mentioned above, add strong support to this. It is possible that the materials that the Deacons excavated were from an MSA sub-stage intermediate between the Howiesons Poort sub-stage and the Still Bay sub-stage. At the on-going University of Cape Town excavations at Diepkloof, a 30 cm deposit of MSA artifacts containing neither bifacial points or backed pieces intervenes between the uppermost bifacial point and lowermost backed piece (Parkington, personal communication). It is possible that the Deacons were excavating in the equivalent cultural-stratigraphic horizon in Howieson's Poort Shelter, as suggested in Table 1.1, where it is tentatively assigned to the Die Kelders sub-stage of the MSA, for want of a better alternative. Further testing of this proposition will become possible when a direct comparison can be made with the Diepkloof material.

The other aspect of the "mystery", why the radiocarbon dates (all between 19,000 and 4,000 BP) are anomalously young for the MSA, requires further research not yet undertaken. A planned radiocarbon assay directly from a diagnostic Howiesons Poort artifact (see below) was not attempted due to the unsuitability of the sample. All of the dates published from the shelter (J. Deacon 1995) were on charcoal. There was very little organic preservation in the shelter and the charcoal's ages are so far off any for the MSA that they point to an LSA component or natural fire. An obvious solution is to date remaining deposits in the shelter using single-grain OSL. This would still be problematic as the remaining deposits could all have originally underlain the Howiesons Poort deposits. If my supposition is correct, then age estimates in the 70 - 65,000 BP range are to be expected. OSL would also be useful in assessing the state of the remaining deposits (for example, whether they have been recently churned by excavation activities). The presence of a micromorphologist at the time of the OSL sampling would be prudent.

A Singular Find

While going through all of the artifacts from square B4 I encountered a singular find. A small (38 mm long) silcrete blade (Figure 6.1, Table 6.1) stood out as being unusual. To begin with it was a blade, with heavy platform preparation typical of the Howiesons Poort sub-stage (Wurz 2000, personal communication) and not an untrimmed flake, as its bag label indicated. Secondly, the blade appeared to be "dirty", with an adhering substance that was absent on all of the other artifacts that I examined from that site. The artifact was excavated from Square B4, layer 3 and labeled "65/14" (denoting the year of excavation and the square and layer, no unique artifact number was given) and placed in a bag labeled "Untrimmed Flakes". A closer look under hand lens and low-power light microscopy seemed to suggest that the adhering material was an adhesive that had been used to haft the blade in antiquity. The residue is concentrated on the steep lateral and obscures the underlying backing that is evident in examination of the ventral face (small scalloping). The opposing lateral, the working edge, exhibited the most obvious usewear I have observed on a Howiesons Poort artifact. As is typical of archaeology I "found" this blade the day before I was to return the collections to the Albany Museum. I made arrangements to temporarily curate the blade at the South African Museum and then I did the next obvious thing, I asked for more money.

My request for additional funding from the Wenner-Gren Foundation was coordinated with the Albany Museum staff, Dr. Lita Webley, director, and Dr. Johann Binneman, head of archaeology. Dr. Bonnie Williamson, of the University of the Witwatersrand and a residue specialist had observed the residue under polarized light microscopy (Figure 6.2). She observed structures that were consistent with starch grains (Williamson, personal communication). This led to the development of a research program that had many parts and partners to address the potential of this artifact.

Compositional analysis was undertaken using laser ablated inductively coupled plasma mass spectroscopy (LC-ICP-MS) at the IIRMES laboratory at California State University, Long Beach by Mr. John Dudgeon. Additional samples were taken and sent to Dr. Curt Beck at the Amber Research Laboratory at Vassar College. These were subjected to chemical dissolution tests and x-ray fluorescence (XRF). The chemical dissolution tests indicated that the residue was not plant resin, animal protein, or petroleum-based (Beck, personal communication). The XRF analysis showed an absence of carbohydrate bonds indicating that no organic component (or dateable carbon) was currently part of the residue (Beck, personal communication). The LA-ICP-MS analysis was designed to characterize the non-organic elements with samples invisible to the naked-eye. This analysis highlighted the high silica and metals content, iron and titanium, of the residue. It seems likely that the organic component of the adhesive has fully mineralized. Planned radiocarbon assay of the residue was not undertaken due to the apparent lack of datable carbon.

The mineralized adhesive contains a large iron component. Wadley (in press) has demonstrated experimentally that it is likely that MSA toolmakers added ochre to vegetable adhesives as binding agents. This corresponds well with the remaining adhesive residues observed on the blade. The possibility that the residue is a naturally occurring ferricrete deposit is unlikely. While ferricrete would have many of the sample compositional elements as mineralized adhesive with an ochre binder, no other artifacts in the assemblage were observed with the residue. It strains credulity that the only artifact with a ferricrete deposit would be a heavily utilized backed blade and that the location of the residue would correspond to expectations for its hafting as a scraper (as suggested by the usewear studies).

Usewear analysis was undertaken by Dr. Richard Fullagar, University of Sydney, a specialist in usewear on silcrete artifacts. This was accomplished in two ways. First, I utilized the environmental scanning electron microscope (eSEM) at the IIRMES laboratory at California State University, Long Beach to obtain digital images at between 50 and 1,500X magnification (Figure 6.3). The advantages of eSEM for archaeological samples are that no coating (usually a gold-palladium alloy) need be applied to the artifact for imaging and the sample is not introduced to a vacuum. This means the analysis is non-destructive and the artifact does not need to be cleaned prior to imaging. Secondly, the utilized edge was cast in dental impression compound (Colténe Whaledent, Affinis™ light body polyvinylsiloxane) (Figure 6.4). One impression and a complete set of eSEM digital images were sent to Dr. Fullagar for analysis. A second impression was kept in Seattle as a back-up. The usewear is consistent with the blade having been hafted transversely and used as a scraper on wood (Fullagar, personal communication). An example of a similar tool from the LSA is in the collections of the South African Museum (Figure 6.5).

Fullagar’s complete description of the usewear follows:

> I have cut the peel, following the edge itself, as closely as possible. I examined the surface of the ventral side of the peel, and noted dark specks of unidentified residues along the slightly rounded edge. So it is relatively easy to microscopically follow the actual

edge in several places. There are no clear striations that I could see, but there are alignments (of smoothing or polish) that are oriented transverse to the edge (on the proximal side of centre). There is also more smoothing on the ventral surfaces relative to the dorsal surfaces, several millimetres back from the edge. It is difficult to assess function specifically just on the basis of the peel, in part because very thin, greasy films on the artefact (perhaps from handling) can simulate smoothing or polish at high magnification. I think this is not the case here (in at least some places) because details of depressions have a fine grainy appearance at high magnification unlike the smoothed surfaces in immediately adjacent areas. However, the degree of rounding and smoothing or polish back from the edge, and the degree of scarring on the dorsal surface indicate a relatively hard material and pressure downward on the ventral (contact) surface. The dorsal scars appear from the photo appear to have bending initiations (with no Hertzian impact points). It is difficult to discern a clear net-like or reticular pattern, but this does appear in some places more dominant than even smoothing of the surfaces. The discontinuous rounding and smoothing, the (rare) transverse alignments are all consistent with wood scraping, at least as the dominant function. Sawing can probably be eliminated because I would then expect clear

> longitudinal striations and alignments and more symmetrical wear patterns (which are common on experimental tools that I have used to saw grooves in wood and bone). Scraping hard wood often causes step scars on the contact surface, but I could not see any on the peel. [Fullagar, personal communication, 2005]

Previous explanations and descriptions of the Howiesons Poort backed blades and segments have focused on their probable use as armatures for spears (Sampson 1974, Deacon and Deacon 1999). No Howiesons Poort lithic artifact has ever been found in a hafted or composite tool context. It is further assumed that the hafting was accomplished by using a resinous glue or “mastic” to attach the lithic artifact to a wooden or bone handle (Deacon and Deacon 1999). Again, no evidence for adhesive use has ever been found associated with Howiesons Poort artifacts and evidence on MSA or Middle Paleolithic artifacts in general is either very late (Boëda *et al*. 1996, Holdaway 1996) or weak. The analyses undertaken and the context of the artifact suggest several things.

Firstly, the backed pieces of the Howiesons Poort can now be said to have been hafted as part of composite tools based on some evidence. Secondly, the most often assumed function of these composite tools has been as hunting weapons. For the artifact discussed here, the only Howiesons Poort tool that shows evidence of hafting and has been subjected to usewear analysis, a function as a wood scraper is most likely. This does not mean that other functions for Howiesons Poort backed pieces will not be eventually demonstrated. The analyses of this one artifact highlight how little evidence has been gathered on Howiesons Poort or MSA tool function to date.

Possible Wider Implications

The recognition of a Howiesons Poort composite tool functioning as a scraper has some implications for interpreting social dynamics. As long-speculated spear armatures Howiesons Poort backed pieces were parts of “male” tools. This is incorporated into both Deacon and Wurz’s (1996) model of reciprocal exchange and Ambrose and Lorenz’s (1990) model of increased mobility. Scrapers are extractive tools and as such “female”. This alone requires a reassessment of the models of Howiesons Poort social dynamics. Taken a step further, it may have been women who invented the “precocious” lithic technology of the Howiesons Poort, not men. Deacon and Deacon (1999) proposed one possible scenario of Howiesons Poort subsistence that included increased use of vegetable foods such as corms and tubers. The composite scraper described here may have functioned as a processing tool for just such food items, supporting the idea of the increased importance of these. Together with the local nature of the raw materials used to make them and the time intensive search for those materials (Chapter 4), the speculated upon role of women and plant foods would radically alter our interpretations of the Howiesons Poort.

Summary and Conclusions

A reexamination of a 40-year old lithic assemblage from the Howieson’s Poort shelter was undertaken to provide some comparative data on bifacial thinning in the MSA. This was easily enough accomplished and the comparison is informative on differing reduction strategies during the Still Bay and Howiesons Poort sub-stages that goes beyond formal tool typology. Additionally, a possible solution to the “unsolved mystery” of why the 1965 excavation of the site yielded an assemblage that bore no resemblance to the 1927 excavation assemblage is proposed. The 1927 excavators (Stapleton and Hewitt) removed far more of the MSA deposits than the 1965 excavators (Deacon and Deacon) supposed, meaning the latter were excavating beneath the former.

In the course of examining the artifacts from the site an unusual backed blade was identified in a bag labeled “Untrimmed Flakes”. A series of analyses of the residues and usewear on the blade suggest it was hafted using a now fossilized adhesive as part of a composite scraper used on soft wood. This demonstrates both the first good evidence of the hafting of the backed pieces of the Howiesons Poort and that they did not all function as spear armatures, as has long been supposed. I make the speculative suggestion that this also has implications for the gender of the tool makers and users at odds with existing models of Howiesons Poort social dynamics.

Table 6.1: Metrics of blade with adhesive. Howieson’s Poort Site 1965 Deacon and Deacon excavation, 65/14, “Untrimmed Flakes” bag, Square B4, 1’3”-9”-1’ Depth, “Root Layer”, Layer 3, 1/9/65, Albany Museum, Grahamstown.

Maximum dimension	**Length**	**Width**	**Thickness**	**Platform Width**	**Platform Thickness**	**Platform Type**	**Termination**	**Weight**	**Raw Material**
38	38	13	4	7	4	Faceted, lipped	Feathered	2.0	Deep red fine-grained silcrete

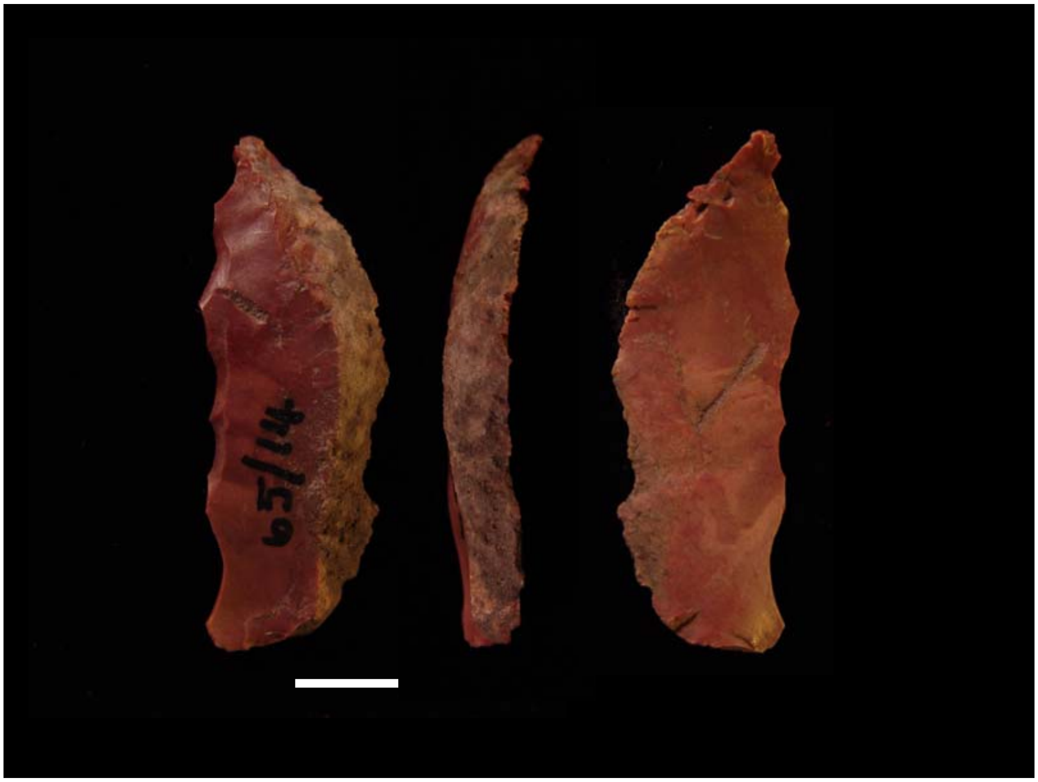

Figure 6.1: Dorsal, lateral, and ventral views of blade with adhesive residue, bar is 1 cm.

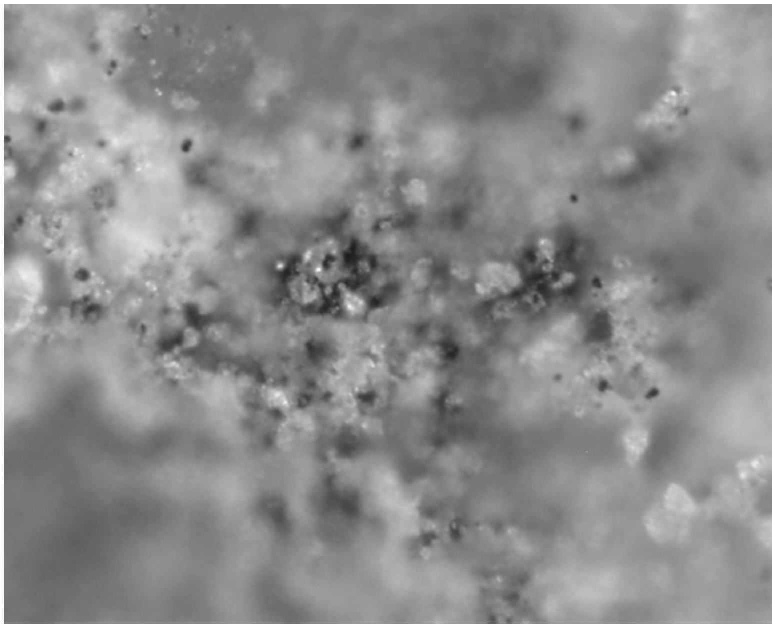

Figure 6.2: Residue under cross-polarized light microscopy showing starch grain structures at 500X magnification. Image courtesy of B. Williamson.

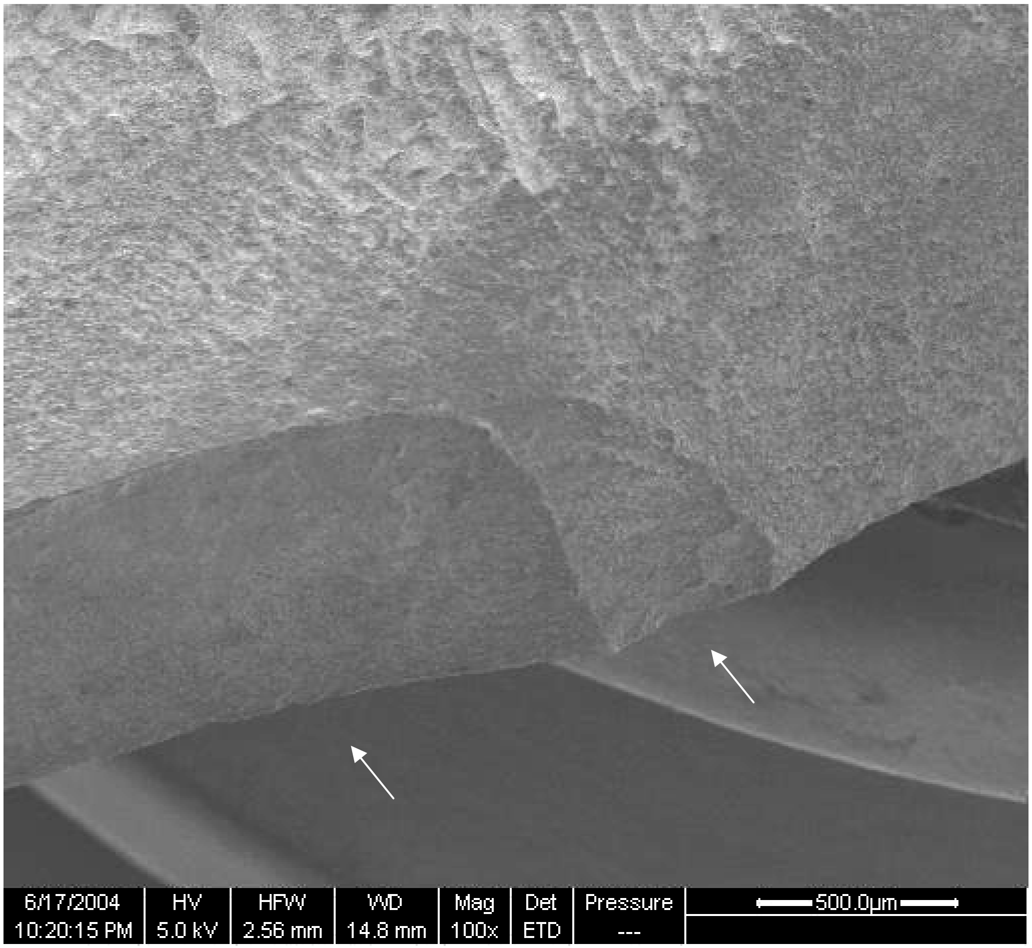

Figure 6.3: Utilized edge at 100X magnification under eSEM. Note hinged fractures with a rounded edge along dorsal face.

Figure 6.4: Blade in dental impression material.

Figure 6.5: “Hafted Adze”, largish LSA scraper attached to a wooden handle by a very large glob of “mastic”. From cave at mouth of Touws River, Western Cape, collected by R. E. Dumbleton, Accession number SAM-AA-5535.

Chapter 7: Lithic Artifacts from Pinnacle Point 13B

MAP

The Mossel Bay Archaeology Project (MAP) is an on-going program of research under the direction of Curtis W. Marean, Arizona State University, and Peter J. Nilssen, South African Museum. The goals of MAP are broad but are currently focused on the survey and excavation of several archaeologically significant caves on the Indian Ocean coast at Pinnacle Point, west of the town of Mossel Bay, South Africa (Figures 1.1, 7.1). Some of the caves have evidence for Holocene human use, but the current focus is on those caves with intact MSA deposits. One of these caves, 13B, has been the site most intensively investigated and the findings of those investigations to date are presented here.

The caves and other archaeological sites in the Pinnacle Point area were recorded during a survey prior to the development of a casino and golf resort (Kaplan 1997). Archaeology in the Mossel Bay vicinity has an early history beginning with George Leith's excavation of Cape St. Blaize Cave in 1888 (Leith 1898). Goodwin excavated there in the 1930s (Goodwin 1930, Goodwin and Malan 1935) and the artifacts from Cape St. Blaize Cave were used to define the Mossel Bay Industry or variant of the MSA. Archaeological investigations in the Mossel Bay vicinity were in abeyance until Kaplan and Nilssen's 1997 survey (Marean *et al*. 2004). In 2000 MAP began by testing three of the caves for archaeological deposits, including Cave 13B (Marean *et al*. 2004). Cave 13B was attractive for further investigations for a number of reasons. First, it is a large cave that is 21 m above mean sea level, meaning that preservation of deposits older than the OIS 5e high sea stand are possible (Figure 7.2). Second, MSA-associated hominid skeletal material was present on the surface and in test excavations (Marean *et al*. 2004). Third, no large LSA deposits were apparent making access to the MSA deposits easier and interpretations of the artifacts less problematic. Finally, calcrete deposits overlie the cave and the resultant buffered groundwater provides excellent bone preservation. Two full field seasons, each of eight weeks duration, were undertaken to further excavate Cave 13B in 2003 and 2004. The lithic artifacts from those seasons were analyzed and coded into a database by myself in the laboratory during the field seasons. Dating of the artifact-bearing deposits is not complete at this time. The best dated deposits are between 40-60,000 BP, with older deposits evident on the basis of stratigraphy (Marean, personal communication). A set of deposits has been identified that dates to late OIS 6 will be the subject of excavation and analysis this (2005) field season. This chapter summarizes the assemblage of more recent origin and places it in a larger context.

Research Goals

The characterization of MSA lithic artifacts in the southern Cape has a long history. Describing the types of artifacts present and making early technological comparisons was the goal for much of that history (Goodwin 1928, Goodwin and

Van Riet Lowe 1929) and some of this early work occurred in the environs of Mossel Bay (Goodwin 1930, Goodwin and Malan 1935). The thick MSA deposits at Klasies River led their analysts to propose long techno-temporal schemes in which those deposits were the halotype (Volman 1981, Singer and Wymer 1982). As such the Klasies sequence has served as the yardstick by which every MSA lithic artifact in the region has been measured for a quarter of a century. As I have discussed elsewhere (Chapter 1) there are many stratigraphic and chronometric reasons to believe that this sequence has large gaps in it. In a sense our yardstick is broken or, more accurately, long sections of it are missing.

Wurz (2002) has recently proposed a new scheme for the MSA lithic sequence (Table 1.1), one that has more flexibility for revision and includes more techno-temporal sub-stages than either of the numbered systems. As finer-scaled excavations are described (Soressi and Henshilwood 2004, Marean *et al.* 2004, Villa *et al*. 2005) and the Klasies sequence is reexamined (Wurz 2000, 2002, Wurz *et al*. 2003) it is clear that descriptions of types of artifacts and metrical comparisons from a large number of MSA sites over the entire span of the period are still required. Providing a new reference to the framework of the evolving techno-temporal sequence is the main goal of the current lithic research program at Pinnacle Point. A major secondary goal is to place the raw material choices of the makers of the artifacts in better local geologic context. This context will allow better evaluation of models of foraging behavior and social organization based on lithic resources (Ambrose and Lorenz 1990, this volume Chapter 4). Additionally, new methods for recording and comparing lithic artifacts that recognize some of the analytical difficulties of the dominant coarse-grained raw materials have been initiated and will be fully developed (Bird 2005, Bird and Minichillo 2005).

These goals of the larger MAP program, and the needs of MSA studies generally, fit well with my own research goals. Specifically, it is one of my goals to demonstrate that the stone tool technology of the MSA is not well characterized as “static”. Presentations of new well-excavated lithic assemblages are a basic requirement of such a demonstration and I present one of these here. Additionally, I have developed an approach to raw material characterization that requires examination of secondary raw material sources (Chapter 4). The characterization of the raw material availability in the vicinity of the Pinnacle Point caves has been on-going for three years and will be continued for many more. What I have learned of local and regional raw material availability and variability has already expanded the knowledge of MSA foraging strategies in the southern Cape. And, perhaps most importantly, the approach that I advocate for determining the timing of the emergence of behavioral modernity in the MSA requires regional context *and* fine-grained local datasets. The ongoing research program at Pinnacle Point will provide one of these datasets. Resolving fully the issue of modern human origins will require numerous programs of this type and scale, which fortunately we do have in South Africa at this time. One question that the lithic assemblages can address now is a test of the predictions of the Neural Advance Model. One of those predictions is that technology should take a leap forward at 40 - 50,000 BP, a period that is represented in the 13B assemblage.

Statistical Summaries

The following section summarizes the Strat Aggregate groupings of artifacts statistically. The information from the Access database was imported into the SPSS (version 12.0 for Windows) statistical package for these purposes. All statistical comparisons, unless otherwise noted, are between complete artifacts. The Strat Aggregates used here are briefly described and are necessarily of a coarser-scale than that used to define the StratUnits that compose them (StratUnits are small stratigraphic units and Strat Aggregates are composites of these, based on geomorphology, this is further discussed in Appendix B).

Surface Sediments – Throughout the cave (in both excavation areas) the sediments near the modern surface have been churned, mostly by human traffic. The original context of the artifacts in these sediments is unsure and they are excluded from the statistical comparisons made here, although all of the artifacts were recorded in the exact same way as artifacts from undisturbed sediments and are part of the Access lithic database.

Western Re-deposited Sediments – These are sediments that overlie the intact deposits in the Eastern Area. These are thought to be materials and sediments from the rear of the cave that have been redeposited in the front of the cave. They are not considered in this analysis, although all of the artifacts from these deposits were coded in the same manner as those that are being summarized here and are included in the lithics database.

Roof Spall – This is a sequence of StratUnits that occurs only in the Eastern Area (Figure 7.3). This is essentially the *in situ* archaeological deposit in the mouth of the cave that is not cemented to the walls or floor. In my analysis I sometimes refer to these as the Eastern deposits. These deposits date to between 40-60,000 BP, based on U-series assays of flowstone and a single ^{14}C estimate (Marean, personal communication).

Lightly Consolidated Facies – These are the obviously artifact-rich deposits which are brecciaed to the walls and possibly the floor of the cave, at least in the Eastern Area (Figure 7.3). Sample sizes from these layers are quite small and no analysis for some categories (for example, cores) is possible. When analyses are possible these are treated as a separate analytical unit from the other intact deposits in the Eastern Area. These deposits date to late OIS 6 at around 180,000 BP, on the basis of OSL assays (Marean, personal communication). This area will be the focus of the 2005 field season and after that time meaningful numbers of artifacts will be available.

Light Brown Sand Facies (LB Sand) – These layers are the uppermost below the Surface Sediments in the Western Area (Figure 7.3). When gross scale comparisons are required due to low sample sizes (as with the core analyses) I lump all of these together as Western Upper. The age of these deposits is unknown, but is older than 60,000 and younger than 180,000 BP, based on a tentative stratigraphic relationship with other, dated, deposits in the cave (Marean, personal communication).

Dark Brown Sand Facies (DB Sand) – These are sediments below LB Sand layers in the Western Area (Figure 7.3). They are interdigitated with Light Brown Grey Sand Facies (LBG Sand) layers. For the purposes of my analyses these are lumped together as Western Lower. The age of these deposits is unknown, but is older than 60,000 and younger than 180,000 BP, based on a tentative stratigraphic relationship with other, dated, deposits in the cave (Marean, personal communication).

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Perhaps the oldest sediments in the cave are below the Western Lower layers. Light Brown Silt, Laminated Facies, Boulder Facies, and Boulder Beach are stratigraphic aggregates that have very low artifact sample sizes and are not included in these analyses unless otherwise specified. These deposits have been dated to older than 300,000 BP by OSL assay (Marean, personal communication).

In summary, my large stratigraphic units for analyses are Roof Spall, which overlies, and is thus younger than, the Lightly Consolidated Facies in the Eastern Area, and Western Upper and Western Lower, in the Western Area. Unfortunately the relationships between the deposits in the Eastern and Western Areas are unclear at this time. It is thought that the Western Area represents an occupation that is older than that in the Roof Spall and this seems to be supported by the lithic artifacts generally.

<u>Core Rejuvenation Flakes</u> – These are sometimes referred to as “core tablets” and are flakes that have been struck across the platform of a core in order to reestablish a good platform angle on the working face of the core. All of the core rejuvenation flakes in this assemblage are quite similar in morphology, looking like they were removed from a single-platform core, and are very similar in form to the core rejuvenation flakes from Klasies (Volman 1981, Singer and Wymer 1982). One striking difference between the core rejuvenation flakes from the different stratigraphic aggregates at PP 13B is in size. This is shown in the boxplots of length for all core rejuvenation flakes not from disturbed contexts (Figure 7.4). There is a size trend from the Eastern Area (Roof Spall) to the

Western Upper and then Western Lower, smallest to largest. What is not shown in the boxplots, however, is that the size distribution for the Eastern Area is bimodal and those for the two Western Areas are unimodal. This is clear when the distribution of very small ("tiny" in the comments field of the database) is examined. These tiny core rejuvenation flakes all have a mass of less than 3 g. When disturbed layers are removed from the analysis all of the tiny core rejuvenation flakes are from the Eastern (Roof Spall) layers. Of the nine core rejuvenation flakes from this area five are of the "tiny" size class, compared with no "tiny" core rejuvenation flakes, out of eleven total for the Western Area (Upper and Lower combined). A statistical analysis shows that this pattern is significant, $x^2=4.91$, $p<.05$. The addition of small blade or bladelet cores to this MSA assemblage suggests a Howiesons Poort or Post-Howiesons Poort sub-stage affinity for the Roof Spall layers.

Cores – Cores are considered by many analysts to the most informative artifact for determining the organization of technology for an assemblage (Conard *et al.* 2004). Not counting hammerstones, core fragments, core rejuvenation flakes, and cores from disturbed contexts 69 cores were included in the analysis. The typology of the cores was recorded in both Geneste's (1985) and Volman's (1981) systems. Geneste's typological categories are shown as a bar graph clustered by area and grouped by type (Figure 7.5). The typological profiles for the Eastern and the Western Lower are most similar to one another and this is borne out in the

Volman typology as well. The Volman typology is shown as a bar graph clustered by area and grouped by type (Figure 7.6).

The Eastern area is dominated by discoidal/radial cores, whose products would be Flakes, Dejeté flakes, or Convergent Flake-Blades. A statistical analysis of the core distributions shows, that even though the percentages are quite different, the higher representation of radial cores in the Eastern layers is not significant; $x^2=1.70$, $p<.05$. Other common core types in the Eastern (Roof Spall) layers are Levallois and Cores on a Flake. The only bifacial core (artifact 30471) and only bladelet core (artifact 30513) from undisturbed contexts are also from the Roof Spall layers. This bladelet core is suggestive of a Howiesons Poort or Post-Howiesons Poort affinity for the technology in at least some of the Roof Spall layers and is well-matched to the “tiny” core rejuvenation flakes from these layers. Other than this bladelet core, cores for the manufacture of blades are absent in the Roof Spall layers, this pattern, of small blade or bladelet and radial cores, is similar to the Post-Howiesons Poort layers at Sibudu cave (Villa *et al*. 2005).

The Western Upper layers have the smallest presence of discoidal/radial cores, and the largest presence of cylinder and single platform cores. None of these difference are, however, statistically significant. The Levallois technique is present, although at the lowest frequency for any the of the MSA analytical units in the assemblage.

The Western Lower layers are similar to the Eastern layers in a large representation of discoidal/radial and Levallois cores; the primary difference between the two areas being a complete absence of bladelet production in the Western Lower layers. Cylinder cores are also present suggesting blades are a desired product of a least some of the tool-making in the Western Lower assemblage.

The cores from all of the analytical units show a generally varied MSA approach to producing lithic artifacts, with radial, single platform, and Levallois approaches present in all areas in various amounts (Figures 7.5, 7.6). The only significant change in core reduction strategy occurs in the Eastern layers with the addition of small blade or bladelet production to the other generalized MSA toolkit.

<u>Flaked Stone</u> – This is the category for all of the non-core artifacts larger than 1 cm or that were plotted as single finds in the field. 4,033 cases were in the original database, after the roof fall that were plotted in the field as artifacts were discarded 3,230 cases remained. Of these, 1,545 cases are complete artifacts, for some of my description and analysis only these are used. After the artifacts that came from Section Cleanings and disturbed or surface contexts are removed

complete 957 cases remain. These are divided into the same gross stratigraphic aggregates as the cores with the addition of LB Silt being added to Western Lower and Fault Zone Fill being added to Western Upper. The Lightly Consolidated Facies is too poorly represented for comparison here and all of the sample for that Stratigraphic Aggregate in the 2003 and 2004 seasons where the result of cutting micromorphology columns and lack stratigraphic controls, but I will comment on my impressions of those materials.

The types of artifacts present in each gross stratigraphic aggregate do not appear to be very different at first glance (Figure 7.7). Some differences are obscured by the crude typology, however. The Eastern Area (Roof Spall) does not have more "blades" but it has more bladelets. When these are accounted for the apparent differences of this area in comparison to the others is removed. In essence two goals of the lithic production of the Eastern Area are bladelet production and discoidal core reduction producing flakes. The Eastern Area also has fewer Convergent Flake-Blades which are replaced in the assemblage by Dejeté Flakes. This is result of the increased use of radial flaking techniques and reduced use of Levallois techniques, although consistent with the changes in core use neither one of these observations is statistically significant at the .05 level, utilizing a x^2 test. This is consistent with the assignment of a Post-Howiesons Poort sub-stage to the Eastern layers.

The differences in the Geneste types in the three areas analyzed here is almost entirely in the “Levalloisness” of the assemblages. Both Western Areas (Upper and Lower) have more Levallois products than the Eastern Area (Roof Spall). This difference, x^2=1.83, is not significant at the p<.05 level; it is, however, significant at the p<.20 level. This is consistent with assignment of the Eastern Area to the Post-Howiesons Poort sub-stage and the two Western Areas to some, undetermined pre-Howiesons Poort MSA sub-stage(s). An additional difference between the Eastern Area and Western Area (Upper and Lower) is a higher incidence of bifacial thinning flakes in the Eastern layers (Table 7.2). The 3% figure for the Eastern Area is less than for Still Bay assemblages (Chapter 5) and is likely the result of heavy use of radial core reduction strategies, rather than bifacial point manufacture. The 1% figures for both of the Western Areas are negligible and comparable to almost any non-Still Bay MSA assemblage.

One category where the two Western Areas do differ is in raw material choices. While all of the layers at PP 13B are dominated by locally abundant quartzites and quartzes the Western Upper has a slight increase in the use of silcrete as a raw material (Figure 7.6). Increased use of silcrete is associated with both Still Bay and Howiesons Poort sub-stages, but none of the technological characteristics of those distinctive lithic industries are present in the Western Upper layers. It is more likely one of the fluctuations in raw material choices, like at Die Kelders, which are poorly understood and may be the result of changing raw material availability through sea level changes.

The final area where differences are noted between the three areas is in size (Figure 7.7). This follows the general temporal trend noted within many MSA sequences of older artifacts being larger and smaller artifacts being younger. Assignment of the Western Area to part of the established sub-stage scheme for the MSA is difficult although there is some suggestion of a Die Kelders-like affinity for the upper layers in that area and possibly a Mossel Bay sub-stage (MSA II or MSA 2b) affinity for the lower layers. Both of these affinities are weak and only very tentatively given and in many ways these layers do not well match the scheme as it is classically described.

The artifacts that I have observed in the Lightly Consolidated Facies and the few that have been recovered from there are larger, exhibit more use of the Levallois technique, and appear to have more formal tools than any of the layers in the Western Area. This suggests greater antiquity for the LC Facies than for other artifact-bearing layers that have been excavated to date. The artifacts seem to conform to the Klasies sub-stage (MSA I or MSA 2a) descriptions better than the Western Areas to any description, although many more artifacts will be needed from firm contexts to conclusively make a technological assessment.

Edge Damage Study

While analyzing and recording the lithics from the 2003 field season I noticed almost immediately that many of the quartzite tools had what appeared to be edge damage or usewear. I recorded the presence of this damage in the comments section of the database as PED (for possible edge damage, terrible name I know, I meant possible human-induced edge damage). Observing edge damage on coarse-grained raw materials is challenging and due to this is likely seldom attempted on quartzite or quartz, the raw material classes that dominate the Pinnacle Point assemblage. I tried to get around this challenge by using a very bright focused light (in this case a microscope illuminator). I worked closely with Cate Bird in developing the methodology and in recording the edge damage. We presented a poster on our results (Bird and Minichillo 2005) and Cate wrote her honors thesis at Arizona State University (Bird 2005) on our study. The following summary is taken from those two sources.

It is difficult to record and analyze patterns of edge damage and retouch on stone tools without oversimplifying the data. Graphical summaries of retouch and edge damage are useful for comparing tools and assemblages, and provide a basis for examining questions of function and taphonomy. In this section I present a method for recording, presenting, and analyzing these complex data, and work through an example utilizing the 2003 and 2004 lithic assemblage. The combination of GIS, rose diagrams, and polar statistics provides a statistically robust approach that can be used to advance our understanding of MSA tool use.

Methodology

For each edge-damaged or retouched artifact, we marked the centroid, oriented them with platform down on a grid, and then took digital photographs of both faces (Figure 7.9). Next we imported the digital photos into ArcView™ where they were rectified to an accurate scale. Using rectified images is important for taking accurate measurements of distance, angle, and area, and for creating vector maps of each face. We then digitized each flake scar on-screen as an individual polygon on vector maps of each face (Figure 7.9). Each vector map is coded with the specimen number, face, raw material, and general shape class. It is then possible to overlay artifact outlines to create a visual summary of edge damage locations for an assemblage (Figure 7.9), similar to the visual composites that I made for the Still Bay bifacial points (Chapter 5).

Three general shape classes (flakes, blades, and convergent flakes) that were recorded in my original analyses were used to organize the artifacts (Dejeté and Side-struck were too small of samples to be used). Artifacts were also divided by raw material class to prevent different mechanical characteristics or differences in observability from biasing the results. The example that has been worked through is for convergent flakes made on quartzite (Bird 2005). Previous researchers have noted that edge damage caused by taphonomic processes is distributed randomly around the perimeter of lithic artifacts. Specifically, for both water transport and trampling the damage “was distributed randomly around the perimeter of the flake” (Tringham *et al*. 1974:192). Conversely, retouch and use wear can be expected to have non-random distributions around the perimeters of lithic tools. Like most other MSA lithic assemblages from the southern Cape, the 13B assemblage is primarily composed of quartzite. Assessing edge damage on this coarse-grained raw material is difficult and potentially imprecise using traditional analysis techniques. Data were collected in such a way that we could look at the distributions of edge damage on an assemblage level macroscopically, as opposed to at the artifact level and microscopically. Edge damage was divided into two types for coding: Type 1 exhibits many of the features, such as regularity, several contiguous removals, and size, usually associated with retouch, and these were recorded as retouch in my initial analysis, and Type 2 exhibits irregularity in shape and size of damage and the causal agent could not be determined (either usewear or natural processes). This led us to ask a couple of simple questions.

1. Is Type 2 edge damage on convergent flakes distributed randomly or non-randomly?
2. What can these distributions tell us about the use and maintenance of these tools in the past?

Generating Rose Diagrams

The starting and ending angle of each flake scar was measured in one-degree increments on a 360 degree plane (Figure 7.10). These numerical values were entered into RockWorks™ to create rose diagrams (Figure 7.11) for both dorsal and ventral faces. These are useful displays that help to visualize patterns in the data. In each of the diagrams displayed the length of the petals are the total number of degrees of edge damage in that five degree arc. However, other steps are required to determine whether the observed patterns are statistically significant.

Calculating Polar Statistics

For the final step, the numerical values for edge damage length and location were imported into Oriana™ statistical software. For each rose diagram shown (Figure 7.11), Kuiper's test of randomness and Rayleigh's uniformity test of direction were calculated. These tests are appropriate for the analysis of circular or polar data. Table 7.4 presents the results of the statistical tests for distributions represented by the four rose diagrams. As the p-values show, the null hypotheses that the distributions are random or without direction can be rejected in each case.

Discussion of Edge Damage

In the cases examined here, the rose diagrams show that Type 2 edge damage on convergent flake-blades has a non-random distribution. This suggests that the

Type 2 edge damage is the result of human behaviors rather than taphonomic processes. The majority of the damage appears along the lateral edges, rather than at the tip of the ventral and dorsal faces. Polar statistics verify the significance of this pattern. The strong patterning of damage along the lateral edges of the dorsal and ventral faces suggests use perhaps for cutting, scraping, or sawing for many of the convergent flakes. The patterning also appears biased to one side. If a flake is held in the “natural” position of thumb on the dorsal surface and left edge (for a right-handed user) pressed down, that edge seems preferentially used in this assemblage. Again, this seems non-random and biased toward a population of users that more frequently use or initiate use with the right hand. Taken together with observations of impact fractures in the same assemblage this data may also be indicative of tools that were employed in multiple ways, with shape class alone being a poor indicator of function. Collecting experimental data on use-wear patterns that result from different activities on similarly coarse-grained materials would permit testing for specific uses. Currently, the same set of artifacts that have had detailed recording of their usewear and retouch patterning are being investigated by Marlize Lombard for residues (Lombard 2005). Combining the spatial patterning of the residues with the usewear in the GIS database will provide new insight into MSA tool use in the very near term.

This method for recording the locations of retouch and edge damage allows for a high level of precision in their quantification. In turn, data gathered in this way can be subjected to statistically robust tests. This can be useful in many lithic assemblages for documenting macroscopic edge damage, especially, as in the Cave 13B assemblage, for artifacts whose coarse-grained material make them difficult to analyze microscopically. Usefully, this method was developed for use in the field laboratory setting using software packages, such as ArcView™, that are now commonly present on most field projects. Other ways to get the same results are possible. For example a flatbed scanner could be used in place of the digital camera in image capture. The scanner would have the advantage of the images needing no further rectification and the disadvantage of placing dirty rocks on the glass.

Other Observations

While examining the lithic materials from Cave 13B at least some benefit was gained by not washing the artifacts. In three cases what appeared to be mammalian hair has observed adhering to lithic artifacts (Figure 7.12). The comparative collection needed to properly characterize the hairs does not presently exist, although this type of inquiry could be very fruitful in the future. One possibility is that hair roots are preserved on some specimens and that these may provide viable DNA for analysis. These artifacts have been set aside and further analyses will be undertaken when there is a reasonable chance for successfully gaining useful information from them.

Raw Material Surveys

In order to augment the raw material surveys conducted by Brown (Brown n.d., Marean *et al.* 2004) in the Pinnacle Point area further surveys of raw material variability in the Mossel Bay area were undertaken (Table 7.5). Much of the focus of these surveys was to locate finer-grained raw materials that may be locally available in secondary deposits.

Cobble Beach Survey

On 27 March, 2003, Panagiotis (Takis) Karkanas traversed shoreline from Cave 13B eastward Cave 5 to a large cobble beach in a crescent-shaped embayment. We performed two quick raw material surveys and made other raw material observations on both legs of the walk.

Random Cobble Survey

This survey consisted of walking to middle of the large cobble beach and placing a 2-meter tape parallel to the shoreline (9:30-10:15 am, low tide that day was at 6:41 am). All cobbles that lay in contact with the tape were then surveyed using the following method. Each cobble was weighed on portable scale, due to the wind all weights were rounded to the nearest gram. Each cobble was flaked using a geologic hammer and a flake preserving both cortex and clean interior was labeled with permanent marker for later assessment. 50 cobbles were surveyed in this way. In general, a narrow range of quartzites were found with some variability in grain size and hardness noted (96%). Coloration ranged from very light grey to pinkish grey. Takis believed that these were older than the quartzites of the cliff face. A small number of the cobbles were quartz (4%). These had been more completely metamorphosed than the vein quartz in the cliff face. They may have been abraded from the conglomerates (probably Enon) observed on the hike from the site to the beach.

Non-Random Survey

After completing the random survey Takis and I split up and roamed the beach for 15 minutes looking for the “five prettiest rocks” we each could find. Of these ten rocks a much higher percentage were quartz (60%), including some nearly crystallized “smoky” quartz, than was recovered during the random survey. One sample was a calcite bedded in calcrete that was very fine-grained. While fine-grained calcite would make excellent cutting tools and has desirable flaking characteristics it may be under-represented in archaeological assemblages due to post-depositional dissolution in groundwater.

Little Brak River Survey

This pedestrian survey was along the west bank of the Klein Brak River, beginning at the train trestle and moving up river during low tide (3 April, 2003). Along the way a number of conglomerate deposits were observed both *in situ* in the bank and sliding down to the river. These contain pebbles and cobbles in a sandy matrix. Along the river itself this conglomerate has eroded into the pebbles and cobbles forming a rocky bank. This contrasts with the east bank of the river, which is uniformly sandy. Just south of the N2 bridge is a large exposure (10+ meters) of the conglomerate. It is dominated by quartzites (mostly greys), includes a fair number of fine quartzes (mostly milky whites), but also contains some fine grey silcrete, all in cobble form. This is the Klein Brak Formation, a Pleistocene-aged conglomerate (Malan 1991). Contents of this formation are variable, but include fine-grained raw materials that would have excellent knapping and functional characteristics.

Hartenbos River Survey

I visited the Transand gravelling operation just north of the town of Hartenbos in the Hartenbos River valley with Peter Nilssen (24 February 2004). This was the reported source of the silcrete-rich gravels that were used for road improvements near the sewage treatment plant at Pinnacle Point. The manager of the Transand plant stated that they were mining the Enon Conglomerate, although there is some question as to whether the Enon contains silcretes and other fine-grained silicates, and it is likely that at least some of the gravelling is being done in the Klein Brak Conglomerate. We spent a couple of hours walking up and down washes looking for raw materials. Small nodules of very fine-grained silcretes and cherts were located, though not in abundance and usually only a couple of centimeters in diameter. A variety of ochres of high-quality were also located as well as some fully petrified wood of knappable quality. The deposit of gravels here is massive covering several hectares and at places tens of meters thick. Gravels of this type are obviously exposed and moved around in the small river valleys of the area with some frequency.

Discussion and Conclusions

The examination of the lithic assemblage from PP 13B has provided some interesting results so far, and work here is far from complete. One of the major research goals, to compare the lithics here to the Klasies halotypic sequence, has had mixed results. Part of the assemblage fits into that scheme well and part of the assemblage does not. The Roof Spall layers in the Eastern Area of the cave match well with Singer and Wymer's (1982) MSA III & IV or Wurz's (2002) Post Howiesons Poort sub-stage. Although it must be said that the technological analyses and descriptions in Villa *et al*. (2005) for Sibudu Cave made that conclusion possible, especially their description of the cores. If the Post-Howiesons Poort sub-stage is to get a unique name then the Sibudu sub-stage seems appropriate as it is there that it was first technologically described and well-dated.

Techno-temporal affiliations for the layers in the Western Area are more difficult to make. They are clearly pre-Howiesons Poort MSA and show temporal trends in size and technology internally, none of which can presently be demonstrated to be statistically significant, but do not conform well to the established MSA sequence based on the Klasies halotype. As such the lithic sequence at PP 13B can be added to increasing evidence that the Klasies yardstick is incomplete. Further excavation is required to get a good handle on the place of the Lightly Consolidated Facies in this sequence and this will be accomplished during the 2005 field season.

The raw material survey in the Pinnacle Point vicinity is on-going but much has been learned already. Within a 15 km radius of the MSA cave sites the survey has identified quartzites in primary geologic and beach and stream cobble form, quartzes in primary geologic and beach and stream cobble form, and silcretes in primary geologic and beach and stream cobble form, especially in the large conglomerate deposits of the Klein Brak Formation. All of the classes of raw materials in the MSA lithic assemblage at PP 13B were available to foragers in the local setting.

As to the question, “does the technology change dramatically at 40-50,000 BP?” the answer is somewhat ambiguous. At PP 13B a change is noted in the lithic technology in the appropriate time-frame. In the Eastern Area, dated to 40-60,000 BP, reduction strategies are reorganized to include smaller blade cores and a dominance of simple radial cores, all on locally available raw materials. So, yes, a change has occurred at the appropriate time. Taken in the context of the larger MSA described elsewhere in this dissertation, however, this change seems less than that predicted for the cognitive leap forward predicted by the Neural Advance Model. Other technological changes in the southern Cape and their timing; initial MSA >200 kya, bone tool industry 85 kya, hafted bifaces 75 kya, backed pieces 60 kya, and microlithic industries 20 kya, are all of a greater technological “advance” and occur throughout the MSA (or in the case of the last example, much later), rather than near its termination. In context, the assemblages that have been analyzed to date from PP 13B are more in line with a gradualist model for change than with a “great leap forward.”

The complete database for the lithic artifacts, a set of digital images, and photologs are included as pocket material on two CDs. If you are reading this in microfilm a copy can be obtained by e-mail: tminichi@u.washington.edu

Table 7.1: Geneste’s (1985) Middle Paleolithic typology, translated into English (1 For the MSA “Levallois” can be read as “prepared”).

Type Number	Technological Description	Phase
0	checked cobble or block	
1	cortical flake (>50%)	***0***
2	cortical flake (<50%); flake with cortical platform	Acquisition
3	naturally-backed knife	***1***
4	flake	Forming
5	blade	
6	atypical Levallois[1] removal	
7	Levallois flake	***2A***
8	Levallois blade removal	
9	Levallois point	
10	pseudo-Levallois point	Production
11	discoidal core	
12	other core	
13	Levallois flake or point core	
14	Levallois blade core	***2B***
15	overshot flake	
16	core rejuvenation, *lame à crête*	
17	core fragment	
18	Kombewa core; core on a flake	
19	truncated and trimmed flake	
20	Kombewa flake	***2C***
21	indeterminate flake fragment, without cortex	

22	bifacial thinning flake	***3*** Retouching, maintenance and other residue
23	debris from retouching and resharpening	
24	debris larger than 29mm, without cortex	
25	debris smaller than 30mm, without cortex	
26	small fragmentary debris	

Table 7.2: Bifacial thinning flake frequency by stratigraphic aggregate.

Stratigraphic Aggregate	**Bifacial Thinning Flakes**
Eastern	3%
Western Upper	1%
Western Lower	1%

Table 7.3: Statistical tests of distribution of edge damage on quartzite convergent-flake blades.

Category	**# of Faces**	**# of Angles**	**Kuiper's V**	**p-value**	**Rayleigh's Z**	**p-value**
T2 Ventral (unflipped)	18	770	6.626	< 0.01	27.15	< 0.001
T2 Dorsal	19	1376	9.341	< 0.01	176.405	< 0.001
T2 D + V (flipped)	37	2146	10.232	< 0.01	186.353	< 0.001
T1+T2 D+V (flipped)	46	3185	11.723	< 0.01	182.916	< 0.001

Table 7.4: Distances of identified raw material sources from PP 13B.

Source	Raw Material(s)	Distance (km)
Table Mountain Sandstone	bedrock quartzite, vein quartz, nodule quartz	<1
Cobble Beach	cobble quartzite, cobble quartz, calcite	<1
Hartenbos Gravels	cobble chert, cobble silcrete, cobble quartzite, cobble quartz, petrified wood	11
Klein Brak River	cobble quartzite, cobble quartz, cobble silcrete	13
Gourits River	cobble silcrete, cobble hornfels	25
Klein Karoo	bedrock silcrete, bedrock hornfels	50

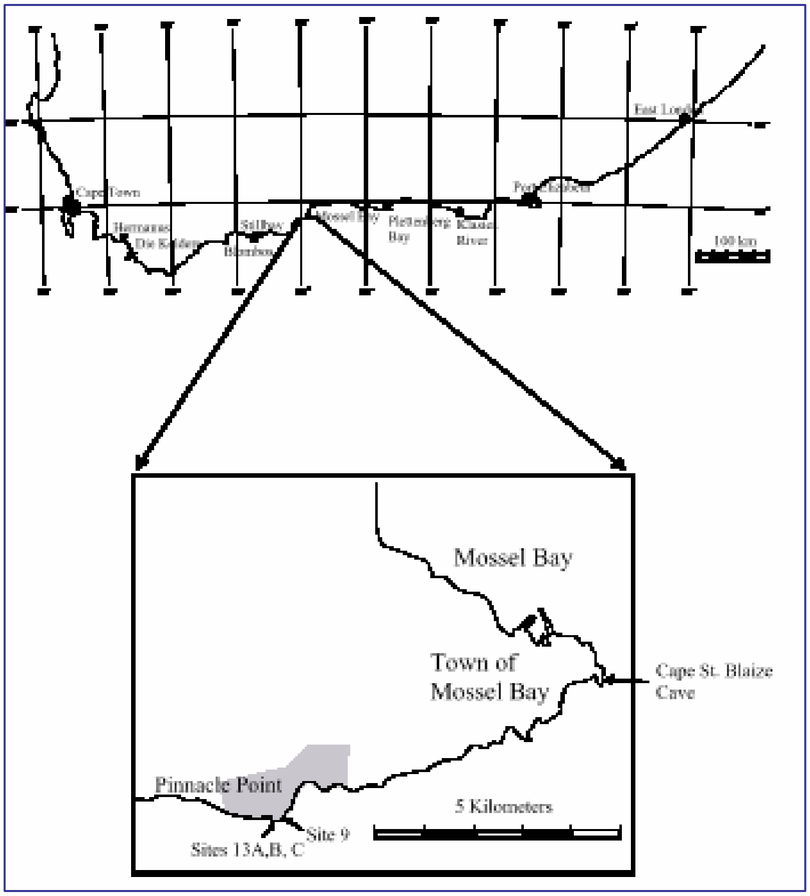

Figure 7.1: Map of the Mossel Bay vicinity showing the location of Pinnacle Point. Figure from Marean *et al*. 2004.

Figure 7.2: Pinnacle Point Cave 13B at top of stairway, sea level is at bottom of photo, 21 m below cave mouth. .

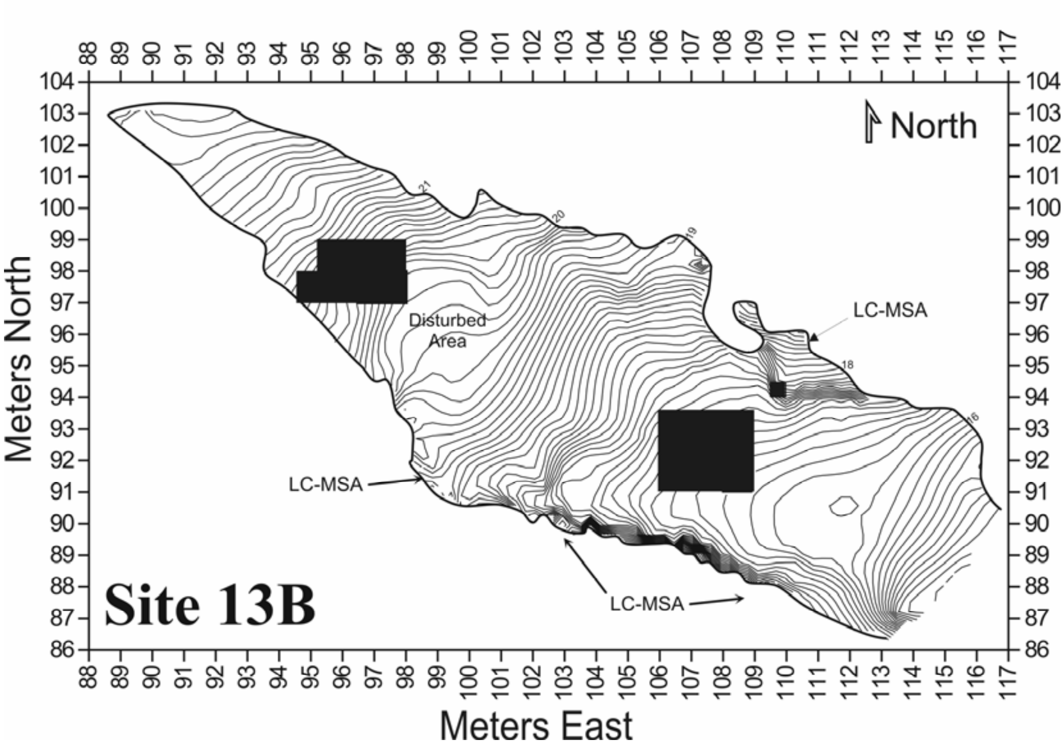

Figure 7.3: Topographic map of the interior of Cave 13B. Block on left is Western Area, block on right is Eastern Area, LC-MSA is Lightly Consolidated deposit. From Marean et al. 2004.

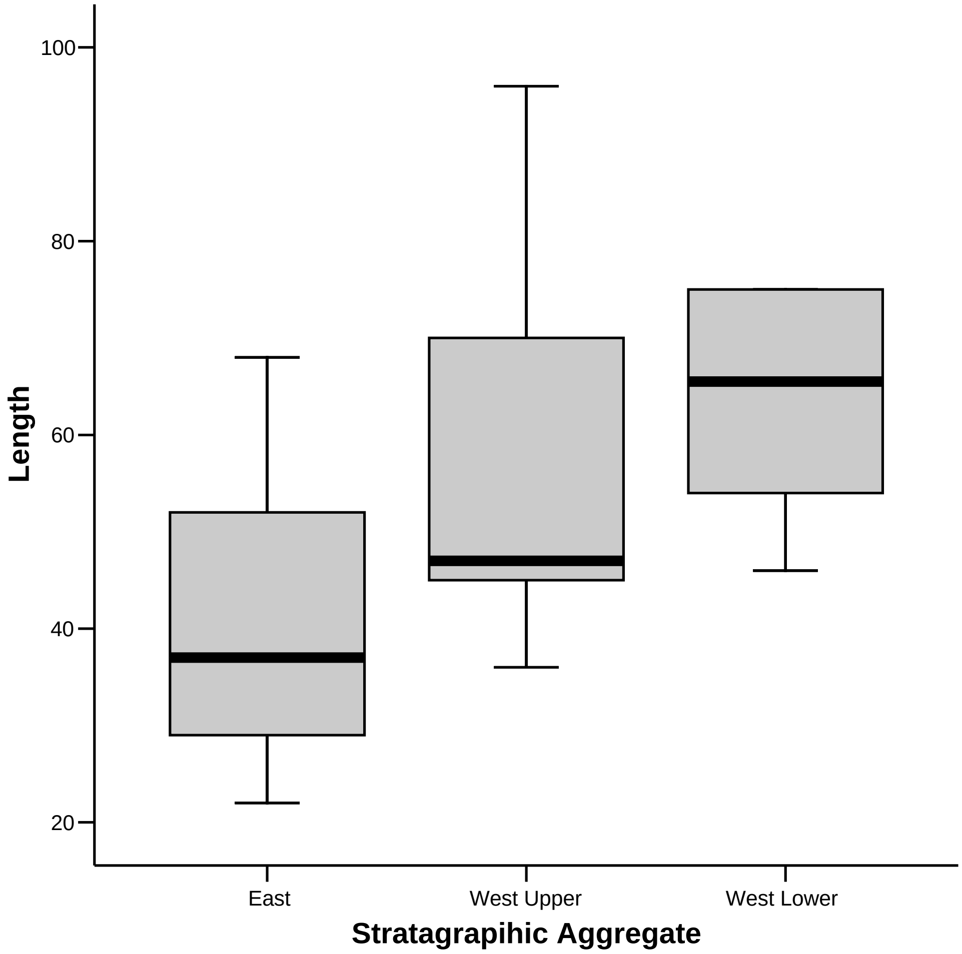

Figure 7.4: Boxplots of the size (length) of core rejuvenation flakes by large stratigraphic units. The size trend is likely temporal, with the youngest to oldest left to right.

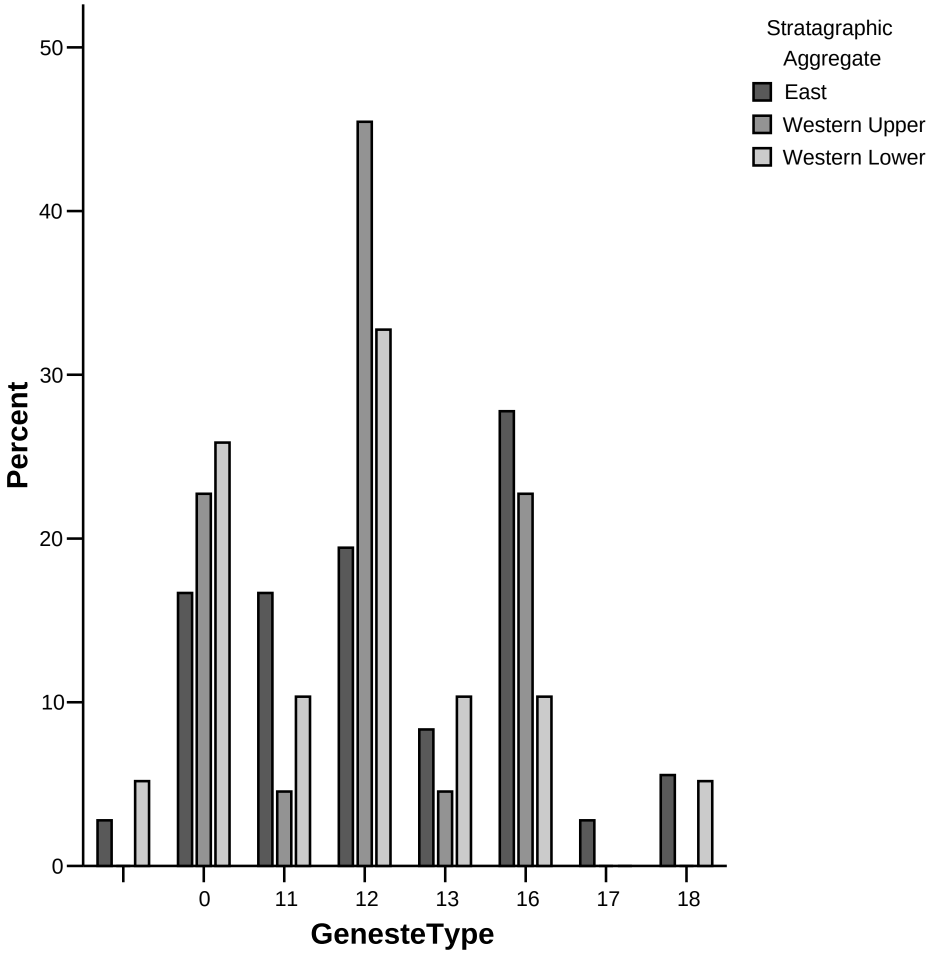

Figure 7.5: Geneste typology (1985) for all complete cores shown as a bar graph. Type 11 is discoidal cores and Types 13 and 14 are Levallois cores.

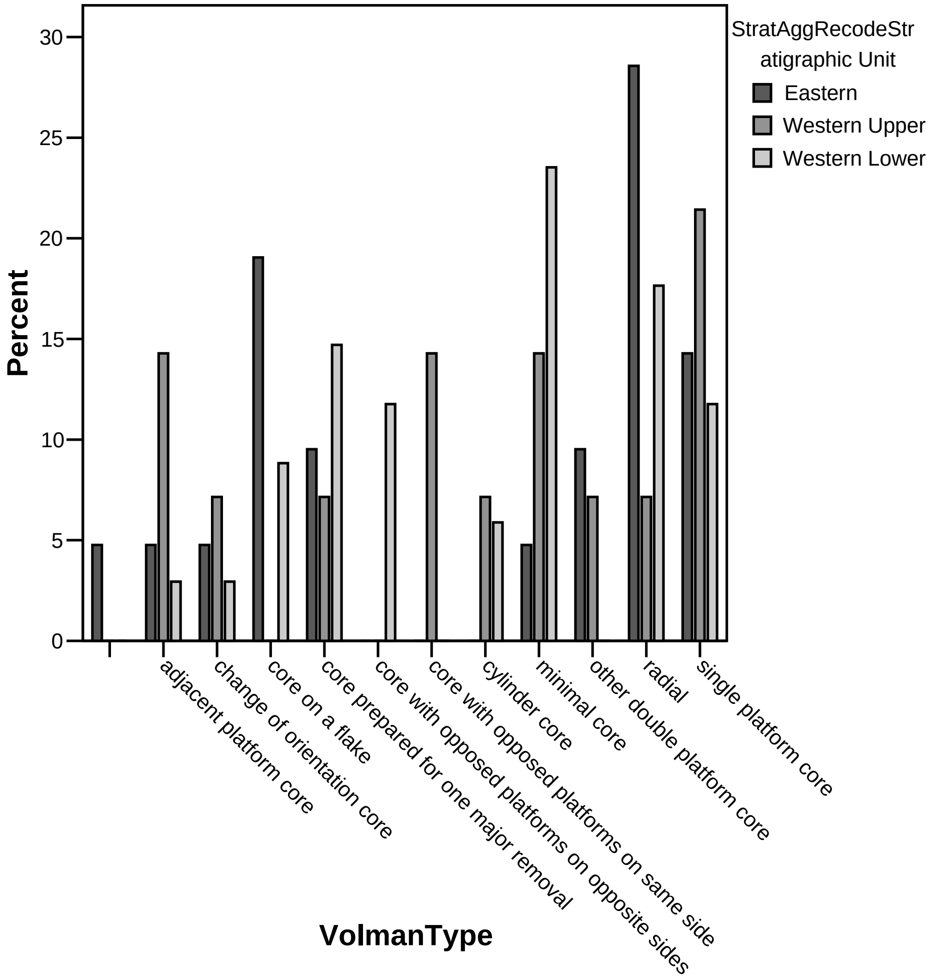

Figure 7.6: Volman (1981) core types for all complete cores by stratigraphic aggregates. The category "core prepared for one major removal" is largely equivalent to use of the Levallois method in other typologies.

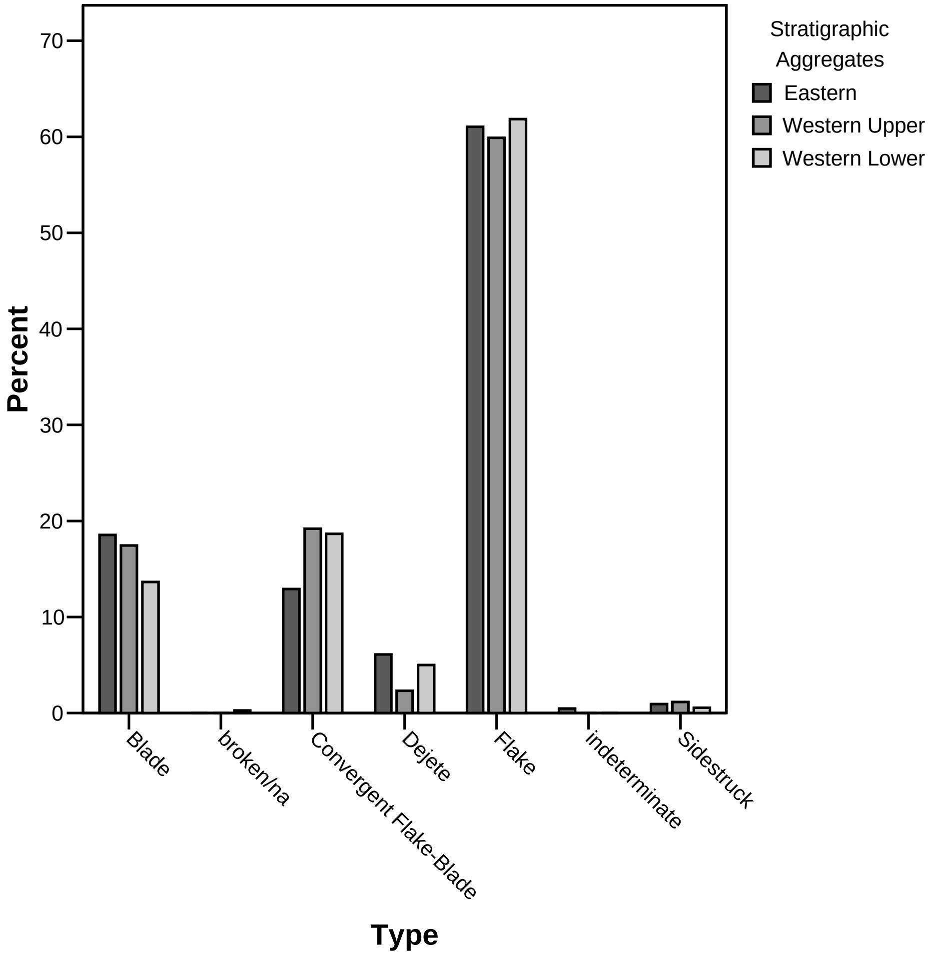

Figure 7.7: General types of products by stratigraphic aggregate.

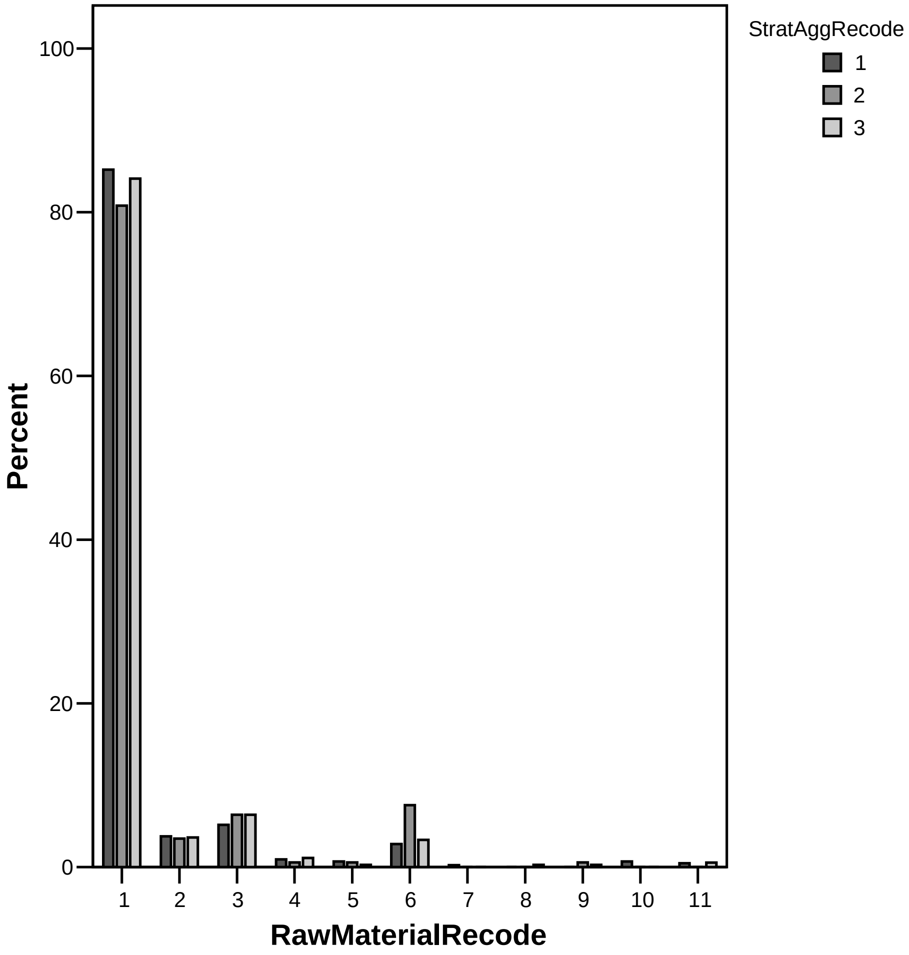

Figure 7.8: Raw material types by stratigraphic aggregates. Types 1-5 are quartzites and quartz. Type 6 is silcrete.

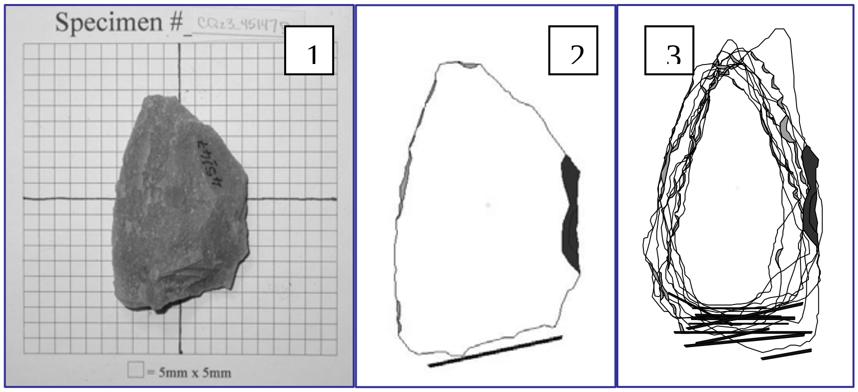

Figure 7.9: (1) Digital imaging of artifact on grid with centroid marked; (2) Vector map of the same artifact in GIS, Type 1 edge damage is marked in black, Type 2 edge damage is marked in gray; (3) Composite of vector maps for all artifacts of same size and shape classes**.** Figure from Bird and Minichillo 2005.

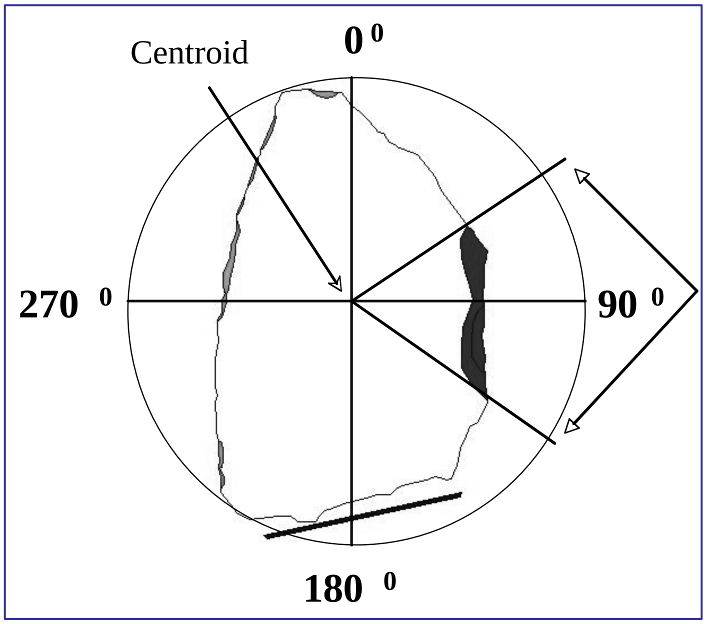

Figure 7.10: Angle measurements for individual polygons. Figure from Bird and Minichillo 2005.

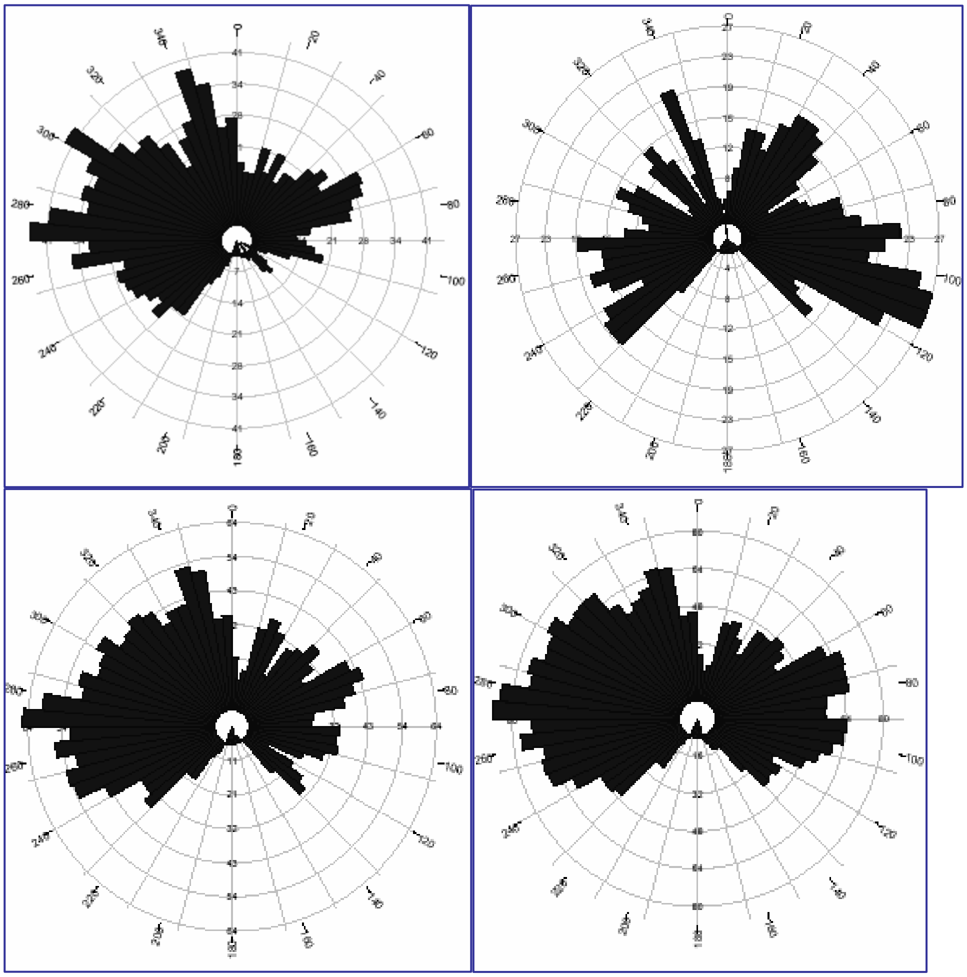

Figure 7.11: Rose diagrams of edge damage on convergent flakes. In each of the diagrams displayed the length of the petals are the total number of degrees of edge damage in that five degree arc. From top left to bottom right, Type 2 damage on dorsal faces, Type 2 damage on ventral faces, Type 2 damage on dorsal and ventral (flipped) combined, Types 1 and 2 damage combined. Figure from Bird and Minichillo 2005.

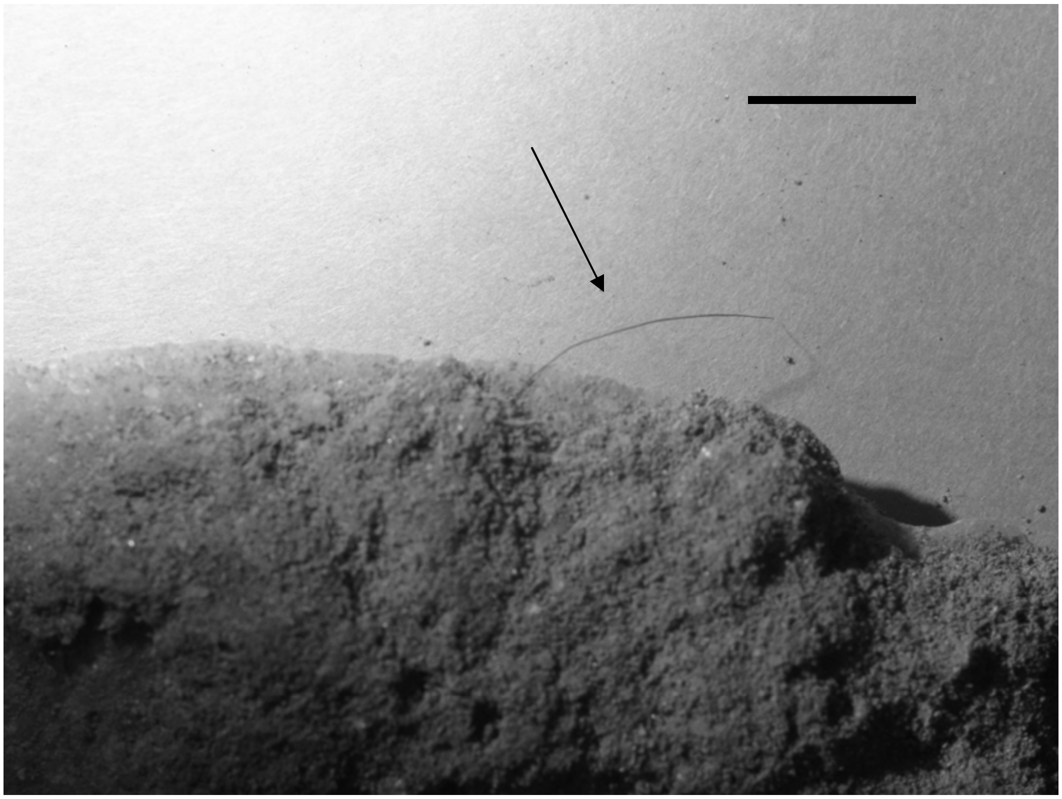

Figure 7.12: Apparent mammalian hair adhering to edge of lithic artifact, bar is 1 cm.

Chapter 8: Summary, Discussion, and Conclusions

This cape is a most stately thing, and the fairest cape we saw in the whole circumference of the earth - Sir Francis Drake (Petty 1577).

The Cape coast of southern Africa is a remarkable place (see above quote from Drake, a man who knew his capes). Not only remarkable for its natural beauty, it is a place that has figured large in understanding the evolutionary history of our species, and is increasingly so today.

During the MSA our species (*Homo sapiens*) emerged in Africa. The MSA began at least 300,000 years ago and persisted until about 35,000 years ago, possibly later in isolated patches. Anatomically modern skeletal material shows up in the archaeological record at around 195 – 160,000 years ago. There remains little debate that these skeletons represent populations that are the direct ancestors of everyone on Earth today, and this is supported by genetic evidence as well. What remains the subject of debate is when, and how, anatomically modern peoples began to *behave* like us. One hypothesis, the Neural Advance model, holds that modern behavior is a relatively late occurrence in the archaeological record, as late as 40,000 years ago. Other models allow for modern behavior somewhat or substantially earlier.

Archaeology began in South Africa nearly as early as it did in Europe and North America. While never approaching the density of archaeological research of those areas a large number of MSA archaeological sites have been collected and accessioned in South African museums. Access to those collections is good and modern infrastructure makes long-term study less challenging. Additionally, this modern infrastructure makes modern excavation and research much easier and less costly than it would be in the less developed parts of Africa. These factors may figure into the prominence of South Africa in African archaeology and modern human origins research, but they do not negate its contributions. Just because evidence is more likely to be found under these conditions does not take away from the veracity of that evidence. And, if the evidence supports models that are not merely descriptions of that evidence, then those models should be the prevailing wisdom for archaeology and paleoanthropology. Currently this is not the case. The prevailing wisdom is based on a model that is incompatible with the archaeological evidence, as I have demonstrated in this dissertation.

This dissertation addressed the problem of the timing of the emergence of behavioral modernity. I did this by first examining some of the long-held assertions regarding MSA archaeological assemblages and the behaviors that have been extrapolated from them. Second, I examined museum collections and archived notes and correspondence, mostly from the first half of the Twentieth

Century. And, third, I analyzed the lithic material from an on-going excavation at an MSA cave site near Mossel Bay, South Africa.

Perhaps the most difficult issue regarding modern behavior is what exactly do we mean when we say “modern”? Matching a list of traits or artifact attributes, particularly one that was developed to differentiate between *Homo neanderthalensis* and *Homo sapiens* in Western Europe, seems most unhelpful. This becomes particularly evident when comparing the Holocene archaeological record from all over the world with this supposed checklist for modernity. Things like standardized bone tool manufacture, long distance trade, and spectacular rock art are simply absent from much of the archaeological record for people that we know were “modern”. For my purposes I defined modernity based on the concept of phenotypic plasticity. That is, the overwhelming advantage to be a technological animal is the rapidity with which we can adjust our phenotype in response to new environmental and cultural settings. Rather than waiting to evolve a specialized set of teeth or claws we make them. As tool use is widespread among primates, it is not the use of tools, but rather, the rapidity with which new technological strategies are developed that makes us special. From this perspective no single technology would then be the marker of modernity, rather modernity can only be observed in context.

At what point in the African archaeological record is there a marked increase in toolkit variability across space and time, where technological choices are drawn from a suite of available and culturally constrained solutions? Answering that question goes a long way in answering when “they” became “us”. To help in addressing this question I placed what we know about the African MSA, the archaeology, morphology, and genetics, in research context. I developed two explanatory frameworks, the Klasies explanatory framework and the Blombos explanatory framework, for that research context. I also proposed a model, the rapid depositional model, to explain the apparent static nature of the technologies in thick MSA cave deposits on the Cape coast.

Assertions of non-modernity of MSA peoples based on Eurocentric thought are easy enough to dismiss (even though a view can be Eurocentric and still essentially correct). What is more difficult to dismiss is the conclusion of Richard G. Klein that MSA peoples were less effective in their use of the animal resources available to them than LSA peoples in similar settings. In Klein’s view this alone is enough to disqualify MSA people from being modern. Klein has had a distinguished career as an archaeologist and analyst of African fauna and is the author of *the* text on human evolution and paleoanthropology, *The Human Career*. His voice of authority could not be louder and through his books and many seminal articles this assertion of non-modernity for MSA peoples prior to

50 – 40,000 years ago has gained wide currency among non-Africanist archaeologists and the public.

Klein is a scholar of the highest caliber. He makes explicit statements that can easily be tested using archaeological data and, more importantly, he publishes all of the data that he used to reach his conclusions. The latter unfortunately remains the exception, rather than the rule, in African prehistory. To examine the idea that MSA peoples were less effective hunters I used Klein's published data. I set as my null hypothesis the idea that diversity, or taxonomic richness, should be higher in LSA than it was in MSA assemblages. The sample sizes needed to be accounted for as the assemblages vary in size by orders of magnitude. I chose to use regression analysis, with richness on one axis and assemblage size on the other, to compare the LSA and MSA data. In this type of analysis it is the slope of the regression that matters and, if Klein is correct, the slope for the LSA data should be significantly greater than that for the MSA data. I found just the opposite to be the case. Additionally, some of the LSA data points lay very close to the MSA regression line and I wanted to see if there was a temporal component to that patterning. When I subdivided the LSA data into Pleistocene LSA and Holocene LSA it became clear that there was. The Pleistocene LSA regression line was nearly identical to the MSA regression line, while the Holocene LSA regression line remained flat. This simple statistical exercise demonstrated two things; my null hypothesis that Klein was correct could be rejected, and, there was a climatic component to the gross scale differences observed between MSA and LSA faunal assemblages.

In order to offer an alternative explanation of the remaining pattern I used behavioral ecological theory to show why and under what conditions different prey would enter into the diet of Stone Age peoples. This type of explanation requires neither an invisible shift in intellectual capacity (as Klein's model does) nor the collection of new types of data to be tested. Two parameters, the size of the prey species and whether the species presents a physical threat, can be used to model entirely the patterning in the faunal record. This model also shows that while Pleistocene peoples were increasingly expanding their diets, Holocene peoples were even more so. These dietary expansions might have been in response to increasing population size or density or in reduced resource availability.

A second characterization with a strong empirical basis of MSA peoples as behaving in non-modern ways was presented by Stanley H. Ambrose and Karl G. Lorenz in their seminal paper on lithic raw material use during the Howiesons Poort sub-stage of the MSA at Klasies River. Utilizing published data, Ambrose and Lorenz posed the interesting questions "What does the pattern of raw material use tell us about mobility?" and, "What kind of mobility pattern would be expected for modern hunter-gatherers in similar environmental settings?" That this examination should occur for the Howiesons Poort is not surprising. The Howiesons Poort is one of the most remarkable technological occurrences during the MSA. It is marked by an abundance of backed pieces, presumably (and now demonstrably) as parts of composite tools and dates to around 60,000 years ago. As a cultural phenomenon that is technologically sophisticated and earlier than the 50,000 years cited in the Neural Advance model for behavioral modernity the Howiesons Poort is certainly something that needs explaining.

Ambrose and Lorenz began their explanation by characterizing the nature of the raw materials utilized by MSA people at Klasies River. Quartzite is locally abundant (the caves are themselves made of quartzite), quartz is less abundant, and silcrete, a fine-grained material whose bedrock sources are minimally scores of kilometers distant from the caves, is even less so. During the Howiesons Poort the occurrence of silcrete increased dramatically from its representation in earlier and subsequent MSA layers. Fine-grained raw materials seem to have been preferred for the manufacture of the distinctive composite tool components of the Howiesons Poort. In the reporting of this site the original excavators lumped all of the quartzites together as “local” and all of the quartzes, silcretes, and other fine-grained materials as “exotic” or “nonlocal” for analytical purposes. Ambrose and Lorenz made the error of interpreting “nonlocal” as literally meaning they were from some distance away and it is this that led them to conclude that the

Howiesons Poort peoples have much higher mobility than earlier and later MSA peoples at Klasies.

While the bedrock sources for silcrete are quite distant the people at Klasies were utilizing silcrete (and other “exotics) in the form of river transported or beach cobbles. An examination of silcrete cores from Klasies clearly shows this. This use of secondarily deposited silcrete cobbles is a recurrent theme at MSA sites along the Cape coast and can be demonstrated for my assemblage from Pinnacle Point 13B near Mossel Bay and at Blombos Cave. Additionally, quartz occurs in both seams and cobbles coincident to the quartzite bedrock (hardly nonlocal). I offered an alternative explanation that used a time-dependent model rather than a distance dependent one. When this assumption is corrected Ambrose and Lorenz’s analysis, and their conclusion of non-modernity, must be dismissed.

In addition to the Howiesons Poort an earlier MSA lithic phenomenon, the Still Bay, has recently gathered attention as it is present at Blombos Cave in layers that have yielded fine bone tools, geometric carvings on ochre, and shell beads. All of these prominent items on the modernity “checklist”. Dating to around 75,000 years ago the Still Bay is marked by the presence of large fully bifacial points. For my study I examined Still Bay points (and fragments) and debitage from all of the known Still Bay assemblages with the exception of Blombos Cave (Blombos Cave is the subject to on-going analysis by Marie Soressi). In analyzing the bifacial point fragments I developed a method for displaying composites of points. These composites clearly show size and shape trends as well as what parts of the points tend to be missing. I analyzed the debitage for bifacial thinning flakes and was able to make comparisons to other MSA assemblages, including a column from the Howieson's Poort shelter. My results show that Still Bay points were clearly hafted; and that they functioned as knives, spear points, and as symbols. Still Bay points have a specific form that appears to have been culturally determined. They are restricted in time and space and are thus a very early unambiguous expression of style. This expression of style, coupled with the personal adornment that appears at this time, suggests that group and linguistic identity were constructed in fully modern ways by at least this time.

While examining the debitage from the Howieson's Poort shelter I encountered a most unusual artifact, a small silcrete backed blade that had a residue adhering to one lateral. This residue appeared to be the remains of the adhesive that had glued this tool into a handle. This is the first direct evidence of Howiesons Poort tools actually being hafted as part of composite tools, confirming their long-speculated-on function. I applied for and received permits from the South African Heritage Resource Agency, and organized a team of specialists from South Africa, Australia, and the United States to analyze the blade. While not as comprehensive as I had initially hoped the results of this study do demonstrate the hafting of the backed pieces of the Howiesons Poort and that, at least in one case, they were parts of composite scrapers, not armatures of spears as has been widely conjectured.

I served for two field seasons (2003, 2004) as the laboratory director and lithic analyst for the Mossel Bay Archaeology Project (MAP). MAP is a large, internationally-staffed, and on-going research program examining the MSA from traditional and innovative perspectives. Currently we are focused on a large MSA deposit-bearing cave, Pinnacle Point 13B. The lithic artifacts that I have analyzed from that cave as part of this project both provide a comparison to my museum collection studies and stand alone as a new contribution to the understanding of MSA technology. My results remain tentative while the issues of dating are resolved and further excavation is undertaken. What can be said is that a post-Howiesons Poort component is present in the cave and that some earlier components are as well. By looking at these artifacts with the new eye required by the Blombos explanatory framework some interesting results in usewear patterning and the presence of hairs was noted.

Taken as a whole, the accumulating field evidence already amounts to a clear rebuttal to the idea that modern behavior is a development of the past 50,000 years. It suggests that full intellectual capacity and social and linguistic constructions are in place by at least 75,000 years ago in southern Africa and this can be considered an upper limit, the latest, not earliest, that modernity arose in our evolutionary past. I examined the only two explanations of the MSA record that support a recent date for modernity and are empirically-based, those of Klein and Ambrose and Lorenz, and found that they can each be dismissed on empirical grounds. Beyond simply dismissing the existing explanations I have proposed new explanations that can be tested using archaeological data.

The lack of research, in the areas and of the intensity required by the largest question for world archaeology and human evolution is being slowly remedied. A growing handful of dedicated archaeologists is addressing this deficiency and I count myself among them. This dissertation is only a first step in my contribution to solving these problems. Very few people working in Africa are in it halfway. As Klein recently said (although in making an entirely different argument), "…interesting ideas are easier to come by than well-dated sites…and in the end the separation of pattern from noise will depend mainly on the accumulation of additional high-quality data" (2000:33). So we wait while Blombos and Diepkloof, Sibudu and Pinnacle Point fill in the partial sketch provided by Klasies. As that sketch is filled in some details are becoming clear; that anatomically modern humans were behaving in fully modern ways by at least 75,000 years ago in southern Africa. And the time depth for this is likely much earlier as we have pretty good evidence for sophisticated behaviors back to OIS 5e (125 kya). That MSA technologies are diverse, have a rapid cycle of change, and exhibit "style". And that the much asserted “sub-optimal” patterns in MSA behavior are not fully supported by the data.

As modern excavations and new analytical methods fill in the gaps in the Klasies sequence and provide additional variability in human behaviors it is clear that these people were us; us living in Upper Pleistocene Africa, but still recognizably you and me. As modern humanity (or so the genes suggest) began to diverge by at least 100 kya the people of the Still Bay sub-stage may be the oldest population that we currently know of that we can reasonably assume has issue. The Cape coast of southern Africa may not be where we all ultimately come from but, if not, it was somewhere in the neighborhood and those neighbors were behaving in very similar ways.

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Appendix A: Glossary of Terms and Site Names

Berg – Afrikaans: mountain or mountain range

Blombos – (Afrikaans: flowering bush) A cave site (Blombos Cave, abbreviated BBC), dune field site (Blombos Sands, abbreviated BBS), single find site (Blombos Schoolhouse), all near Still Bay. Archaic spelling of Blombosch is common in older notes.

Blombos Bo – (Afrikaans: above the flowering bush) Singular artifact from Blombos Schoolhouse.

Cape Flats – Large dune field near Cape Town. This area yielded many of the early artifacts from the Cape Colony but has not been systematically investigated since and is now totally built over. Also, early “culture” name for South African archaeological materials.

Die Kelders – Cave site near Cape Town (Afrikaans: the cellars, abbreviated DK1).

Fontein – Afrikaans: spring

Gat – Afrikaans: cave

Hangklip – (Afrikaans: hanging rock, abbreviated CHK) Cape just east of Cape of Good Hope. The headlands of the cape are dominated by a large sheer rock formation.

Howiesons Poort – (Afrikaans: Howiesons pass, abbreviated HP) Rockshelter site near Grahamstown that is the type site for the Howiesons Poort substage of the MSA. The original spelling of Howieson's Poort (original for archaeology, the actual geographic name is Howison's Poort) was in common use until very recently.

Klasies River Mouth – (Also Klasies River mainsite, both conveniently abbreviated KRM) A set of cave sites on the Tsitsikamma coast that has provided the baseline for the MSA in the southern Cape.

Kleinjongensfontein – (Afrikaans: little children's spring, abbreviated KJF) Dune field site near Still Bay.

Kop – Afrikaans: hill

Koppie – Afrikaans: little hill

Rooikrans – (Afrikaans: red crown) *Acacia cyclops*, a shrubby tree that was introduced to the Cape as erosion control from Australia. Completely out of control, this plant has made many dune field sites inaccessible.

Strand – Afrikaans: beach

Skildergat – (Afrikaans: painted cave) Also known as Peers Cave and Fish Hoek Cave, large cave with long (ESA – LSA) archaeological sequence in the Fish Hoek valley.

Trappieskop – (Afrikaans: little steps hill) Large rocky hill on the Fish Hoek valley riddled with over thirty small caves and shelters, the most archaeologically important of these (Dale Rose Parlour, abbreviated DRP) sometimes is referred to by the name of the hill itself; also known as Eales Cave.

Tsitsikamma – (Khoi: place of much water) Section of the Cape coast that was forested in historic times and encompasses the Klasies River mainsite.

Zeekoe – (Dutch: sea cow, hippopotamus) River valley in the Karoo region of South Africa that has been the subject of systematic survey.

Appendix B: Methodology of Lithic Analyses

This ponderous appendix provides specific information on how each measurement used in the analysis of the lithic materials reported in Chapters 5, 6, and 7 was taken and recorded.

Methodology for Recording Bifacial points

Every bifacial point or bifacial point fragment was subjected to a series of measurements which were entered into a Microsoft Excel spreadsheet. All measurements of length were taken using digital slide calipers (Fowler EuroCal 6-inch) with a direct input into the spreadsheet. All caliper measurements were taken to hundredths of millimeters (0.00 mm) but rounded upon entry to the nearest millimeter (0 mm). All masses were taken using digital scales to the nearest tenth of gram (0.0 g) and entered manually into the spreadsheet. A measure of flake scar density was taken by placing a 1-cm circular template on a representative portion of the artifact and counting all partial or complete flake scars visible within that template. This scar density estimate was applied only to the worked face of unifacial points and fragments or to the dorsal face of flakes. The caliper measurements that were taken were as follows (Figure B.1).

Length - Overall technical length of complete or very nearly complete bifacial points. When this measure is left blank the point is judged to be too incomplete for this measure to have meaning.

Estimated Length - Estimated overall technical length for broken points, based on size and shape clues from the remaining portion. When this measure is left blank and Length is given a value then it is a complete point. If Estimated Length and Length are both left blank then the point is too incomplete to judge what its overall length may have been.

Width Top - This measure is taken one-quarter of the way down from the tip toward the base perpendicular to the technical length. If this measure is left blank then that means that the distal end (tip) of the point is absent.

Width Mid - This measure is taken midway between the tip and base perpendicular to the technical length. If this measure is absent then that means that the point is a base or tip fragment only.

Width Bottom - This measure is taken three-fourths of the way down from the tip toward the base perpendicular to the technical length. If this measure has been left blank then that means that the basal portion of the point is absent.

Thickness - This measure is taken orthogonal to technical length and Mid Width midway between the tip and base of the point. As this measure varies the least of all the measures along the point Thickness is taken whenever any fragment that is judged to be between the Width Top and Width Bottom is present.

Other measures entered into the spreadsheet for each point or fragment are as follows:

Base - The basal portion of each point is assigned a shape based on a template developed for this analysis (Figure B.2). The basal or hafting portions of bifacial points tend to exhibit the freest expression of style. Probably because, although the hafting element is surely functional, the tip ad cutting edges are under strict engineering requirements and can vary little and still perform. That is, points need to be pointy.

Weight - Every artifact was weighed on a digital scale with precision to at least one-tenth of a gram (0.0 g). Weight, when the density of the raw material is taken into account, serves as a proxy for volume. It also serves as a compliment to counts as a measure of representation in an assemblage.

Raw Material - Raw materials for all artifacts are recorded. Some classes of raw materials, such as silcrete, may be additionally described by color or fineness of grain. For example “coarse silcrete” or “very fine grey silcrete” when that description seems to represent real distinctions within an assemblage.

Comment - In this field any additional comments, on the location of apparent hafting, the presence of resharpening, impact fractures, completeness of the artifact, etc., are entered.

Number - Any unique identifying number on any artifact is entered here. In some cases this is simply an accession number for the whole assemblage. In some cases numbers have become illegible. Illegible numbers are recorded with any illegible portions as “?”. For example, “12?4?”, when the third and fifth digit can not be read.

Methodology for Recording Lithics

After the lithic artifacts were separated from the other classes of materials in the lab and labeled with an individual specimen number they were subjected to metric analyses and also carefully inspected for usewear, retouch, staining, and adhering residues. To facilitate the inspection of each artifact a high-output microscope illuminating lamp with fiber-optic arms and lenses was employed. The nature of the raw materials that dominate the assemblage, particularly the quartzites and quartzes made the use of bright light for analyses necessary. In the absence of the bright light many of the technological features recorded here would not have been observed. This information was entered into a Microsoft Access database with separate tables for cores (with hammerstones), all flakes (including retouched pieces), and small flaking debris (flakes smaller than 1 cm in their largest dimension). The lithic artifacts were never washed, although screened artifacts were rinsed with fresh water and sun-dried in the water-screening process in the field. A soft dry brush was applied to a small area so that a label could be applied. Each specimen number was written in black India ink directly on a flat surface of an artifact. Artifacts too small to take a useful label were kept with their Plotted Find tag (even labeled artifacts were kept with an identifying tag of some kind). Small flaking debris that was not plotted in the field was not given individual specimen numbers or labels.

Every flake or unaltered manuport (a stone that is not native to the cave and has no flaked removals or pecking) was entered into the "lithics 1" database, a brief description and comments on recording of the database follows.

<u>Specimen Number</u> – The individual specimen number for each artifact, in many cases this is the Plotted Find number assigned in the field.

<u>Lot Number</u> – This is the number assigned in the field to the smallest stratigraphic unit (StratUnit) and a 50 cm square. This was used after the field season to tie each artifact to larger stratigraphic units for analyses (Strat Aggregates). During analysis all that was known was the Lot Number and as such the analysis was "blind" with no stratigraphic relationships known by the analyst.

Raw Material – This is the class of stone that the artifact was made on. The classes used in this analysis were; Grey Quartzite, Tan Quartzite, Grey-Red Mottled Quartzite, Tan-Red Mottled Quartzite, Coarse Quartzite, Quartz, Vein Quartz, Crystal Quartz, Silcrete, Indurated Shale, Hornfels, Chert, Chalcedony, or Other/Indeterminate. When recording the raw material classes four color classes for fine-grained quartzite were used. The color variability was much greater than this, running from a pale grey that was almost white to a deep reddish brown. Color differences were further obscured by the dirty state of the plotted artifacts. Many of the artifacts recorded as brown-tan quartzites would likely have been greys after a good washing. Many of the color differences involving the reds are likely due to diagenesis of lithic surfaces postdeposition. It is possible that heat-treatment my also play a role in color variability. All of the color classes for quartzite should be considered as one for analysis. The exception to this may be a high contrast banded tan-red that occurs in beds below the TMS exposed on the coast. There is an exposure of this at Cape St. Blaize. Unfortunately these few pieces were swamped by other tan-red quartzites in the coding. The category "Coarse Quartzite" replaces the one (TMS) used in an earlier reporting of the artifacts from here (Marean *et al.* 2004). In general this is the parent material of the cave. The category of "Vein Quartz" occurs naturally in the cave. In a few cases it appears to be clearly worked and this would be apparent in the description. However, if the vast majority of cases are "Indeterminate" and

"Shatter", then these are most likely roof spall and if they dominate a StratUnit it is likely culturally sterile. This raw material is one of the few where the cortex is coded as "Outcrop" and is distinguished from "Quartz" by the parallel planes apparent in the former.

Type – This is the traditional descriptor applied to MSA lithics and is useful for making broad comparisons to other MSA assemblages and for very general descriptions (for example Volman 1981, Singer and Wymer 1982). The types used were Flake, Blade, Convergent Flake-Blade, Dejeté, Side-Struck, Broken/NA, or Indeterminate. Several of the blades appear to have been made with one very steep lateral that was not cortical or backed. These were typically heavily prepared and the steep side opposes a long acute cutting edge. A good example of this is artifact 25716. These are similar to, but not strictly speaking, naturally-backed knives in Geneste's and other typologies, they were just recorded as blades. Blades also often have an edge made up of cortex; this is most often with a parallel removal, although some blades are entirely cortical. The category "Dejeté" was added to the general typological description used in earlier reporting of artifacts from here (Marean *et al.* 2004). These are flakes where the longest measure is at about a 45^{o} degree angle to the striking platform. Many of these are the products of centripedal/discoidal cores. Dejeté flakes grade into "Convergent Flake-Blades", with the distinction between the two being somewhat arbitrary. A good example of one of these ambiguous

“Dejeté”/“Convergent Flake-Blades” is artifact 21073. Type categories follow the general convention of Blades being at least twice as long as wide, Side-Struck flakes being at least twice as wide as long (a category that is almost completely absent at PP 13B), Convergent Flake-Blades coming to a point, and Flakes being the remainders.

Completeness – This is a description of whether the artifact seems complete or is a fragment of a once larger artifact. If it is a fragment a brief description of what part of the original artifact is given (i.e. “Proximal”). For metric comparisons between stratigraphic units and between assemblages complete artifacts only are used, unless otherwise stated.

Maximum Dimension – This is the measure, regardless of orientation, of the longest line segment that fits within the artifact. This is the only linear measure that was taken on every single artifact and has no relation to the technical measures used for more comparative analyses. This measure (with Weight) is a proxy for artifact size and would be the one that is most useful for size-sorting, differential screen recovery, and other taphonomic studies. Like all other linear measures in this study it was taken using electronic calipers* with precision to the hundredth of mm. These were directly input into Access using a USB input and rounded in Access to the nearest whole mm.

Length – This is the technical length. That is, it is the longest dimension measured along the direction of striking. If an artifact's whole Length is absent then this measure is left blank.

Width – This is the longest direction measured perpendicular to Length, regardless of where it occurs on the artifact. If an artifact's whole Width is absent then this measure is left blank.

Thickness – This is the longest measure, below the bulb, orthogonal to Length and Width. If an artifact is incomplete then this measure is left blank.

Platform Width – This is the longest measure on the striking platform in the same direction as Width. This measure is taken any time there is an intact platform present.

Platform Thickness – This the longest measure on the striking platform in the same direction as Thickness. This measure is taken any time there is an intact platform present.

Cutting Edge – This is the total length of acute edge along the entire artifact, regardless of location or completeness. This measure is taken by rolling the artifact along a rule and rounding to the nearest 5 mm.

Platform Shape – This is a description of the shape of the silhouette of the striking platform. All platforms were recorded as being Flat, Concave, Convex, Chapeau de Gendarme, Irregular, or most frequently Platform Missing. A common shape, coded as irregular, is a plain, dihedral, or faceted platform with an “~” shape in profile. On these S-shaped platforms they appear to be preferentially struck on the convex, rather than the concave, surface.

Platform Type – This is a description of the condition of the platform on the core prior to the flake being struck. On an assemblage scale these descriptions are useful in evaluating technological organization. All platforms are recorded as Plain, Dihedral, Faceted, Crushed/Shattered, Pointed, Unknown/Indeterminate.

Platform Angle – Platform angle is one of the most difficult things to reliably measure on an artifact. To record this angle a contact goniometer was applied to each artifact measuring the outside angle (the angle that was on the core prior to striking) near the center of the platform. The angle was recording in broad classes (0^o-30^o, 31^o-60^o, 61^o-90^o, 90^o+, and Indeterminate) in the data base.

Lipping – This was recorded as a presence/absence attribute. Lipping is determined by running your finger across the ventral edge of the platform. If it catches, then it is lipped. If you have to think about it too much, then it is lipped.

This is an informal definition and its relationship to hammer type is not conclusive. On cortical platforms the "lip" may just be a result of the change in material character below the cortical surface.

Platform Prep – This is a recording of the preparation of the platform angle while the artifact was still attached to the core. The preparation was recorded as None, Bruising, Single Flake, Multiple Flakes, Stepped Flake, Multiple Stepped Flakes, and Indeterminate. "Bruising" as a class is likely the result of crushing or roughening of the platform edge to provide more control over the flaking process. Stepped flakes remove a great deal of thickness at the proximal end of the flake and may be used to change the angle of the platform or to have thinner proximal ends on the finished artifacts, or they may simply be previously failed attempts at removing a useable flake.

Bulbar Thinning – This is a presence/absence attribute of the removal of one or more flakes from the bulb of percussion after it is struck from the core. This attribute would also be recorded in the Retouch part of the database. Bulbar Thinning is one of the traits common for artifacts that are intended to be hafted.

Termination – This attribute records the type of edge preserved at the distal end of the flake. It was recorded as Feathered, Hinged, Snapped/Stepped, Burinated, Shattered, Over Passed, or Retouched. Burinated and Shattered terminations may be indicative of impact fractures in use of the artifact. Over Passed in this recording system means that the termination of the flake took off part of the bottom of the core and was not necessarily thicker at the end than in the middle, as is the case for some massively Over Passed flakes. Retouched terminations are those where post-flaking retouch has obscured the original termination type.

Cortex – This is the percentage of the ventral surface that rock cortex. It was recorded in ranges (as these are visual estimates). The recorded ranges are 0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-99%, and 100%.

Cortex Type – This attribute records the type of cortex present on the artifact and is only filled in if cortex is indeed present. The classes recorded were Cobble, Outcrop, and Rind. Cobble cortex could be from beach, stream, or conglomerate cobbles and dominate the cortices in this assemblage. Outcrop cortex is from primary geologic contexts and is rare in this assemblage, with the already mentioned exception of vein quartz. Rind cortex is a description of a cortex that develops in secondary settings for some raw materials, especially silcrete, but is rare in this assemblage.

Scar Density – This is a measure of the number of scars from flake removals that are at least partially visible within a 1 cm circular template placed on a representative portion of the ventral face.

Scar Pattern – This attribute records the patterning of prior flake removals on the ventral face and how they relate to the organization of the core that the artifact originated from. In many cases on the dominant quartzite raw materials the directionality of the scars is indeterminate and is recorded as such. In most cases it is only possible to infer direction when the scar terminates into cortex or the scar is the result of retouch. When scar pattern is evident parallel and convergent flaking dominate the assemblage with a sizable minority of radial/centripedal removals also present. Blade-like parallel removals are common, even on flakes that do not strictly meet the arbitrary 2:1 (length/width) ratio.

Retouch – This is a presence/absence trait for the removal of flakes from the artifact after it has been struck from the core. A series of fairly standard traits were then recorded only on those artifacts that exhibited retouch.

Retouch Location – This is a description of the part of the flake that is retouched (i.e. distal dorsal).

Retouch Type – This is a description of the dominant type of retouch on the artifact using the terminology of Tixier *et al*. (1980). Nearly all burins occur on the tip (impact burin) or on the platform (burin during flaking). These are all of the “technical burin” type referred to in the South African archaeological literature. Burins, if they are real (intentional), dominate the retouched pieces. In “Length of Retouch” for burins the length is the total flake edge removed by the burin blow(s).

Retouch Angle – This is a measure of the edge angle near the middle of the retouched portion of the artifact taken with a contact goniometer and recorded in the same incremental classes as the Platform Angle.

Retouch Length – This is a measure of the total edge length with retouch taken in the same way as the Cutting Edge measure.

Refits With – This is the place where the Specimen Number of another artifact that a refit has been made with is recorded. Refits were rare, but were not a goal of the analysis. The few refits that were recorded were of artifacts on rare and unusual raw material types.

Geneste Type – This is the type number for each artifact taken from Geneste (1985). In general Geneste was trying to develop a typology for the European Middle Paleolithic that had as its goal the discrimination of different stages of artifact manufacture. This typology relies heavily on the presence and absence of cortex and the PP 13B assemblage is well-suited for it. I have translated his type table into English and note that Levallois techniques are loosely applied to the MSA materials (Table 6.1).

Bifacial Thinning – This is a presence/absence attribute. The presence of bifacial thinning flakes would be noted in the Geneste typology as well, as Type 22. The inclusion of a separate category in the database was the result of my other MSA research focusing on bifacial points and bifacial reduction.

Weight – This is the mass to the nearest tenth of a gram for every artifact in the database. Masses were taken using an electronic scale** for every complete or fragmentary lithic artifact.

Unaltered Manuport – This is a presence/absence attribute and represents rocks that have entered the cave through human actions but do not appear to b otherwise modified in any way. Many of the rocks placed in the category Unaltered Manuport are small quartz-quartzite pebbles. It is probable that a large percentage of these have simply eroded out of the parent material of the cave. They are so small as to be of dubious functionality. Other possibilities include; tracked in, included in animal guts/shell fish anchors, or children's toys. The raw material coded for these is what they appear to be based on the cortical surface. In some cases quartz may be coded as quartzite and visa versa. The color recorded for the quartzites is probably incorrect even more often than for other artifacts as the cortex and interior colors vary in unpredictable ways.

Comments – This section is one in which any observations that did not fit readily into the database format were entered. Two abbreviations that were commonly used in the comments section are PED and HP. PED stands for “possible edge damage” and refers to artifacts that it might be useful to examine systematically under a microscope. PED was an unfortunate use of terminology as the edge damage was real; it was just the source of that damage that was being questioned. In later analyses PED was referred to as Type 2 Edge Damage (Bird and Minichillo 2005). HP refers to artifacts that have some Howiesons Poort aspect to them. Strictly speaking, as the Howiesons Poort should be defined by a whole suite of attributes found together no single artifact would make an assemblage Howiesons Poort. LSA artifacts may also get this HP note erroneously attached to them. Other common comments were Chunk and Shatter. “Chunk” refers to a blocky piece that does not appear to be a core. “Shatter” refers to angular debris with no apparent orientation. As noted in “Vein Quartz” above, Shatter (and sometimes Chunk) probably includes some non-artifactual material. Another fairly common comment is “Siret”. Siret refers to flakes that have been split longitudinally through the platform during flaking.

Every core, hammerstone, or core rejuvenation flake (core tablet) was entered into the "cores 1" database. Many of the attributes recorded duplicated the ones described above for the flakes. When measuring Length, Width, and Thickness for Core Rejuvenation Flakes or the single Lame a Crete in the assemblage the artifacts are oriented as flakes and not as cores. A brief description is provided below for those that are different.

<u>Volman Type</u> – This is the core typology applied by Volman to a number of MSA lithic assemblages in his dissertation (Volman 1981). This is given in addition to the Geneste types for the cores. I most cases I found the Geneste typology more useful as it had more categories for the types of cores in the MSA assemblage at PP 13B. I also found the Volman typology confusing and, at least in some categories, redundant. Other analysts I have spoken to have also found this typology confusing. It is only used here to provide some basis for comparison to older assemblages at some time.

<u>Number of Removals</u> – This is a count of all of the partial or complete flake removal scars apparent anywhere on the remaining core.

<u>Scar Pattern</u> – this is the pattern of removals that is visible on the remaining core. This follows the same classes as for the flakes but in most cases it is much easier to determine the patterning on the cores.

Maximum Length – This is the longest measure in any direction on the core.

Maximum Width – This is the longest measure in any direction perpendicular to the Maximum Length.

Maximum Thickness – This is the longest measure orthogonal to the Maximum Length and Maximum Width.

Comments – Some common comments on the "cores 1" table were hammerstone, core rejuvenation flake, and exhausted. Exhausted refers to cores that appear to have been knapped down to a size that no longer could produce useful flakes and was then abandoned. Many of the discoidal core fragments are crude bifacial points and this is noted in their coding. Smaller, more finely finished fragments of bifacial points are coded with the retouched lithics (rather than the cores). Where this distinction is drawn is not entirely clear. If a piece will contribute more to our analysis as a core then it is coded as a core, etc.

The final database table was made up of the "small flaking debris". This category would typically be coded as 23, 24, 25, and 26 in Geneste's typology. All of the lithics entered into this database came out of one of the screens (10 mm, 3 mm, or 1.5 mm). Only flakes and flake fragments are coded here. Chunks and unaltered manuports are not entered into this database and unless they were large enough to be given an individual specimen number during sorting are retained in the original bags, but not entered into the lithics database in any way at this time. This Small Flaking Debris database is designed to examine the raw material variability in the finer fractions, quantify bifacial reduction for comparison to other assemblages, and look for bladelets and bladelet fragments that may have been missed during sorting. With these goals in mind, a fairly high percentage of small debris of questionable artifactual origin, although in many cases retained in the collection, is not coded. Due to the small size of many of the artifacts (especially in the 3 mm fraction) a raw material class for which there is a count may have “0” entered in the weight column. This means that the total weight for that category did not register on a 0.1-gram precision scale. “Total Weight” is an actual measure of all of the Small Flaking Debris together, not a sum of the individual categories. Consequently, summing all of the categories may arrive at a slightly different figure.

* Two electronic calipers were used in this study, a Sylvac EuroCal Mark III 150 mm and a Mitutoyo 500 series 150 mm. Both of these calipers have a .01 mm precision and were linked using a USB cable input.

** OHAUS Scout SP4001 portable electronic scale, 4 kg capacity, .1 g precision.

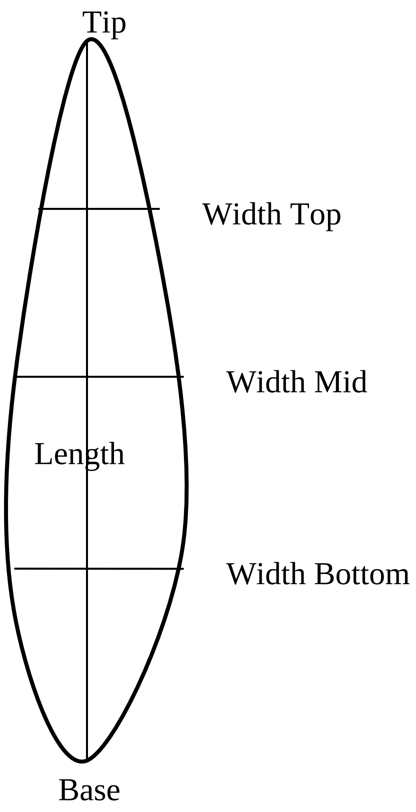

Figure B.1: Stylized bifacial point showing locations of major measures of length and width.

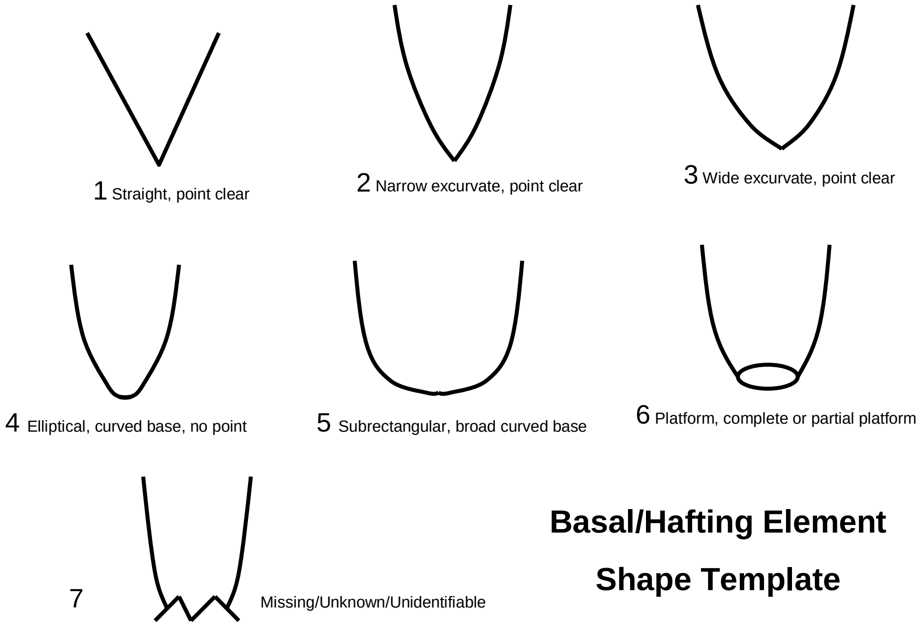

Figure B.2: Template of basal/hafting element types used to classify all of the Still Bay bifacial points.