CHANGING SOCIAL LANDSCAPES OF THE WESTERN CAPE COAST OF SOUTHERN AFRICA OVER THE LAST 4500 YEARS

by

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ABSTRACT

This thesis presents a reinterpretation of the late-Holocene hunter-gatherer archaeology of the Eland's Bay and Lambert's Bay areas of the western Cape. Marked changes in settlement, and subsistence over the last 4500 years had been previously suggested as having resulted from external factors, such as the environment and contact with incoming pastoralist groups. In contrast, this thesis presents hunter-gatherers as active rôle players in the transformation of their society and history. This was proposed as a result of an excavation and dating programme, palaeoenvironmental reconstructions with better resolved time sequences, and the use of an interpretative framework that emphasises possible changes in population numbers and in modes of production, as well as the consequences of these processes.

Between 3500 and 2000 BP, population densities increased and residence permanence became more sedentary, both of which were easily accommodated by a productive environment. Solutions to social stress, resulting from landscape infilling, were not sought through migration, but through the formalization of ritual gatherings at Steenbokfontein Cave. During these gregarious occasions, proper codes of conducts were reinforced, inter- and intra-group conflict was mediated and peoples' identity with the local landscape was also asserted. Coinciding with the increase in population numbers after 3500 BP, subsistence was reorganized around the intensive collection of highly predictable and productive species, such as shellfish, tortoises and plants. Frequent snaring of small and territorial bovids almost completely replaced the hunting of large mobile game. A system of delayed returns was also central to coastal hunter-gatherer economy between 3000 and 2000 BP, whereby the collection, processing and storage of large quantities of shellfish meat was undertaken. The large-scale effort of this activity is attested by the massive build up of large shell middens termed "megamiddens". It seems likely that hunter-gatherers at this time obtained most of the necessary protein from marine resources.

In addition to the pervasive and high levels of social stress, ecological stress became palpable as environmental conditions began to deteriorate after 2400 BP. Ritual intensification no longer provided a solution, and aggregation phases at Steenbokfontein Cave came to an end. Social networks amongst hunter-gatherer groups broke down as a consequence of their fission into smaller social units and withdrawal of some of them to the periphery of the study area. The arrival of stock-owning groups around 2000 BP triggered a series of different responses by hunter-gatherers. These varied from cooperative behaviour, assimilation, avoidance and/or conflict. It is argued that these differences were shaped to a large extent by variable socio-economic configurations amongst pre-contact hunter-gatherer groups. The diet of the newly reconfigured and diverse hunter-gatherer society became overall more mixed after 2000 BP. Shellfish gathering became less important, some hunting of large game was practiced, with most of the diet provided by plant collection, snaring of small antelopes and the capture of tortoises.

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CHAPTER 1
INTRODUCTION

INTRODUCTION:

This thesis is concerned with the Later Stone Age archaeology of coastal hunter-gatherers of the western Cape, South Africa (Fig. 1.1). The period under study comprises the last 4 500 years, although greater attention is paid to the millennia dating to between 4500 and 2000 BP. Field observations were gathered from the Eland's Bay and Lambert's Bay areas (hereafter frequently referred to as the research or study area) (Fig. 1.1).

The study area has been targeted for archaeological research for more than 20 years. Despite this extensive effort, several important questions have remained unanswered. As will be argued in the following chapters, these lacunae stem from a lack of sufficient data, from the particular theoretical perspective employed in the interpretation of the archaeological record, and from a few methodological problems. Thus, the objective of this thesis is to provide a new synthesis of the late-Holocene archaeology of the research area by addressing each of these problems.

The period between 4500 and 2000 BP was chosen as a subject of greater scrutiny because it was known to have covered dramatic changes in hunter-gatherer settlement and subsistence in the absence of contact with other cultural groups. A brief account of this sequence of events, as known before this thesis project was undertaken, is presented here. Human visits resumed at Eland's Bay after an occupational hiatus stretching between 7700 and 4400 BP (Parkington 1981; Robey 1987). In the period 4330 to 2900 BP people focused their domestic activities in caves and rock shelters, at least three of which were first occupied around 3500 BP. Approximately 3 000 years ago, the settlement choices began to change radically. A number of open sites was added to the inventory of places visited and deposits were accumulated at a much faster rate. From 2900 BP until 2100 BP caves and rock shelters appear to have been ignored for habitation in preference for open locations next to the coast. Over time, many of these open sites emerged as huge accumulations of mainly black mussel shells containing variable abundances of charcoal but very little else (Parkington *et al.* 1988). The term "megamiddens" has been used in reference to these sites (Buchanan 1988).

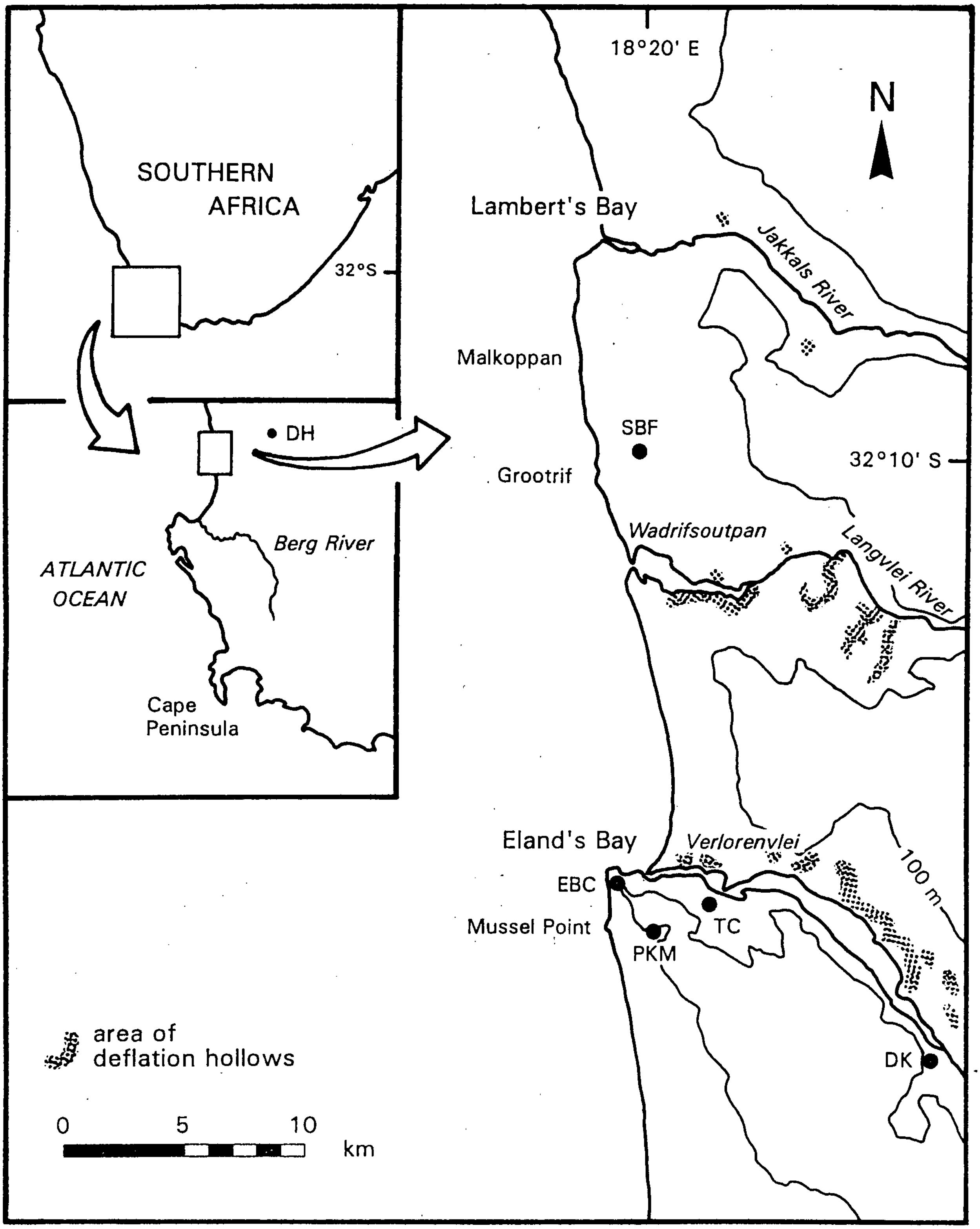

Figure 1.1: Geographic location of Lambert's Bay and Eland's Bay areas within southern Africa, showing sites and geographic features mentioned in the text. DH, De Hangen; SBF, Steenbokfontein Cave; EBC, Eland's Bay Cave; TC, Tortoise Cave; PKM, Pancho's Kitchen Midden; DK, Diepkloof.

Excavations in several of the megamiddens recovered very few cultural remains and little dietary evidence other than marine shell. Consequently, it was hypothesized that these sites represented one component of a wider settlement system (Parkington 1991), and it was further suggested that many of the undated (and still undatable) stone artefact rich deflation hollows located further inland were utilised at the same time (Manhire 1987; Parkington 1987, 1991; Parkington *et al.* 1988). In this scenario the megamiddens were thought to be specialised shellfish gathering and processing localities (Henshilwood *et al.* 1994), whilst the deflation hollows were general domestic locales.

The final date of megamidden accumulation *c.* 2100 BP witnessed the end of the apparent avoidance of caves and rock shelters for the purpose of occupation. Instead, the present evidence indicates that open localities were in turn mostly ignored. More changed, however, than just the places occupied. In the centuries after 2000 BP the volumes of deposit generated by human activities were substantially less than those of megamidden period, but far richer in dietary remains, as well as in artefacts. Interestingly, the date of this change in settlement strategy *c.* 2100 - 1800 BP is broadly coincident with the first appearance of domestic stock and ceramics in the archaeological record of the west coast (Robey 1987; Parkington *et al.* 1988; Webley 1992; Sealy & Yates 1994).

The interpretation of this particular archaeological record was also contentious, as isotopic analyses on human skeletons and those undertaken on archaeological residues were arriving at different conclusions (Parkington *et al.* 1988; Sealy & Van der Merwe 1988, 1992; Parkington 1991). On the one hand, the archaeometric evidence suggested a semi-permanent to permanent settlement pattern at the coast and a high marine food intake during the megamidden period. On the other hand, food-waste analyses suggested seasonal transhumance between the coast and interior for the late-Holocene, and a dietary mix of terrestrial and marine origin. This discrepancy has remained unresolved for several years. Furthermore, despite the radical character of the changes in settlement and diet described for the megamidden period, these were thought to be merely the expression of "adaptive responses" of a society essentially unchanged through time.

At the onset of this thesis project it was suspected that the emerging picture for the 4500 to 2000 BP period was too complex to be easily explained in this way. Based on previous research on complex hunter-gatherers and resource intensification elsewhere in the world (Price & Brown 1985; Mazel 1989; Hall 1990; Stahl 1993), the possibility that changes in the social organization of coastal hunter-gatherers could explain part of this record was regarded as worthy of consideration. The possibilities were: i) Hunter-gatherer groups moved seasonally between the coast and the interior mountains throughout most of the last 4 500 years, following the natural fluctuations in the availability of food resources and raw materials. Major alterations to this pattern occurred possibly after the arrival of pastoralism in the study area *c.* 2000 BP. ii) Hunter-gatherer groups changed their settlement and subsistence pattern before the arrival of pastoralism, whereby seasonal movements ceased to exist (or became very rare) for an extended period of time. In this case, the environment might not have been a major determinant, although it could have affected the result of hunter-gatherer decisions by having been propitious or unfavourable to them. Other factors to which coastal hunter-gatherers might have responded were population increase and related changes in their social organization.

As suggested by the second alternative, this thesis is also concerned with including social issues as part of the explanations of the archaeological record of the study area. As a consequence of this, the theoretical perspective employed in this thesis differs from the one used in previous interpretations, which had a strong ecological component. The justification for this departure resides in a critique of the frequent use of ethnography in the interpretation of the archaeological record, where the environment has been frequently identified as an important variable. The subsistence changes reflected in the massive accumulation of tons of shellfish refuse during the megamidden period do not have a parallel in the ethnographic present. To explain this and other concomitant changes on the basis of ethnographic observations would be to underestimate the richness of hunter-gatherer life in the past, and by extension, of the precolonial history of southern Africa.

The fact that the observed changes in the archaeological record of the study area happened within a short time span (2 500 years), and that palaeoenvironmental observations did not match the chronological resolution of these changes, added some more doubts on the validity of previous explanations based on environmental considerations.

Thus, the approach adopted here is rather eclectic, touching several aspects not previously explored for the archaeology of hunter-gatherers of the western Cape. The research design and interpretation of results are based, to varying degrees, on historical materialism, considerations of population increase in hunter-gatherers societies, greater chronological resolution of relevant palaeoenvironmental sequences, and a critical use of ethnographic analogies. The danger of choosing a multiple approach needs to be guarded against, as the main concern in this thesis is for coherence within the body of observations and the interpretation based on it.

THESIS LAYOUT:

The background to the history of research in the Eland's Bay and Lambert's Bay areas, and a critical assessment of previous interpretations of this particular archaeological record is provided in Chapter 2. This critique touches on aspects of theory and also methodological problems at the empirical level. As a result, an alternative interpretative framework and research objectives are suggested.

The characterization of the marine, riverine and terrestrial environments currently dominant within the research area, and their history of change over the last 5 000 years is presented in Chapter 3. The restrictive or favourable character of the physical and biological environments in the study area is discussed in relation to coastal hunter-gatherer subsistence and settlement over the past 4 500 years.

Chapter 4 provides the description of the locality, stratigraphy and chronology of the sites chosen for the purpose of this thesis project. A complete list of dates for these and other sites previously excavated in the research area is also provided.

Further palaeoenvironmental observations obtained as a result of recent analyses on the archaeological material from Tortoise Cave, Pancho's Kitchen Midden and Steenbokfontein Cave (Fig. 1.1) are presented in Chapter 5. The possible impact on intertidal species due to over-harvesting and/or changes in the marine environment is discussed. A previous explanation proposing a causal relationship between a late-Holocene sea level regression and a marked change in the procurement of marine resources observed for the study area is challenged.

Changes in coastal hunter-gatherer settlement at a regional and intra-site level are described and discussed in Chapter 6. Factors other than the environment, such as population increase, circumscription of mobility and the social stress related to the former two variables, are proposed as important components responsible for the shaping of the archaeological record in the study area.

Chapter 7 describes the material culture recovered from the excavated sites and discusses it in the context of hunter-gatherer mobility, population levels, site function, and contact with herders. A more complete stone artefact sequence for the western Cape is also presented.

Observations on food-waste are provided in Chapter 8, and are compared to previous palaeodietary reconstructions based on isotopic analyses of human skeletal remains. The observed trends in hunter-gatherer diet and settlement between 3500 and 2000 BP are suggested to be consistent with a scenario of resource intensification. The implications of these developments in relation to the subsequent arrival of pastoralism in the study area are also discussed.

A summary of the results and the main conclusions drawn from them is the purpose of the final chapter.

CHAPTER 2

BACKGROUND AND INTERPRETATIVE FRAMEWORK

INTRODUCTION:

For more than twenty-five years, members of the Spatial Archaeology Research Unit (SARU) at the Department of Archaeology at the University of Cape Town, and other research groups and institutions, have been actively involved in the reconstruction of the pre-colonial past in the western Cape. The issues tackled in the numerous projects focusing in different regions within the western Cape (the coastal margin, Sandveld and interior mountains) have mostly dealt with Holocene sequences, and the late-Pleistocene to a lesser extent. Questions regarding subsistence, mobility, seasonality, the kinds of factors behind the choice of a site, the characteristics of contact situations between groups of different ethnic affiliations, and the palaeoenvironmental context of these aspects of past human life, have stimulated a series of projects. As a result, an impressive, though incomplete, body of observations regarding the pre-colonial past of the western Cape has been build up.

The trajectory of research in the western Cape over the last twenty-five years has been influenced by several developments: A changing emphasis of research efforts from one geographical area to one or more others within the western Cape (e.g.: Olifants River valley, coastal Sandveld and the Eland's Bay area), the introduction of new methods and techniques in the analyses of archaeological materials, a few reassessments of the reconstructed past following improvements in the chronology of old and new sequences, and some changes in the ways the archaeological record has been interpreted. For this reason, an historical view of the research developments in the western Cape is important for understanding why particular questions have been pursued by researchers over the years, why others have been dropped, and the circumstances under which archaeological interpretations have changed. Thus, the new research undertaken for this thesis can only make sense in the light of previous work in the same geographical region.

This chapter outlines the history of archaeological research in the western Cape with the purpose of giving a context within which the contribution of this thesis project can be evaluated. Since archaeology is a discipline that has developed almost entirely out of the western world and its interpretative framework (Trigger 1992), a brief account of the first visits by Europeans to the study area and their perceptions of it are also summarized here. A critical assessment of the trajectory of archaeological research in the western Cape is the subject of discussion of the last section. This examination is seen as a precondition for understanding the research objectives and interpretative framework that guides this thesis project, as these have been developed as a result of this critique.

EARLY ENCOUNTERS:

The first encounters between local indigenous and European groups involved Portuguese navigators and pastoralist groups along the southern and western Cape coasts in the late years of the fifteenth century (Raven-Hart 1967). Cattle and sheep-owning people, and others who made their living mainly from fishing and gathering wild food as well as stealing stock, were met by the Dutch after they settled in Table Bay (Thom 1952; see also Parkington 1984a). Shortly after the Dutch East India Company established a refreshment station at the Cape in 1652, several journeys were made to the north and east of present Cape Town in search of trading groups for the aquisition of domestic stock and mineral resources as well as the legendary Vigiti Magna river (Mossop 1931; Serton *et al.* 1971). The earliest journals, dating to the seventeenth century, kept during these trips contain the description of a landscape that had been targeted for European exploration and, in subsequent decades, for territorial expansion. Unfortunately, as the interest of the early new-comers was in natural resources and the means to get and make use of them, only brief written comments were offered regarding the local inhabitants. Exceptions to this are found in cases when trade and political agreements were vital for the success of Dutch settlement at the Cape.

In contrast to earlier written accounts (Mossop 1931), more detailed descriptions of the Cape Fold Belt mountains, Olifants River valley, Namaqualand and their inhabitants were made in 1685 by Governor Simon van der Stel on a long journey to the northern territories searching for sources of copper (Serton *et al.* 1971). On his way back to the Cape of Good Hope, he and the rest of the party visited the coast around Groen River mouth (Serton *et al.* 1971: 325-339). Although his interest was in finding protected embayments for possible use as anchoring places, he did not visit other localities along the coastline, north or south from there. Instead, he sent a few of his men to explore the coastal margins of the Olifants River and Verloren Vlei mouths (Serton *et al.* 1971: 353, 359-361) whilst on his way to the Cape of Good Hope. A few descriptions of local Soaqua groups (possibly hunter-gatherers as discussed by Parkington

[1984a]) were annotated, but, surprisingly, almost no mention was made of old and/or abandoned settlements, that could have been part of the local archaeological record.

Fifteen years later, Johannes Starrenberg, by then Landdrost of Stellenbosch, set out for a journey to the northern territories (western Cape up to Namaqualand) in October 1705. The explicit purpose of this trip was to barter and trade with Khoi pastoralists on behalf of the Dutch East India Company for the acquisition of domestic stock, particularly cattle (Raidt 1973). Not only were somewhat similar accounts to Van der Stel's described in his diary, but the indigenous (Namaqua) names of several land features within the study area and adjacent landscape were also annotated. According to this record, *Quaecoma* was the original name of Verlorenvlei and *Tythouw* of Langvlei River. Starrenberg, like some of the officers who took part in the earlier journey with Simon Van der Stel, visited part of the coastal margin of the study area. This visit was very brief and specific in purpose, perhaps explaining the lack of attention paid to finding possible traces of human life at this particular geographical point (Raidt 1973: 27-29). Stretches of the west coast and Sandveld also seem to have been travelled through by parties of freeburgers on legal or illegal trading and hunting expeditions (e.g. Raidt 1973: 21), sometimes reaching as far north as Namaqualand. Unfortunately, very little is known about these excursions and their encounters.

The recent discovery of a set of original drawings depicting Khoi people engaged in daily activities, at the South African Library (Smith & Pheiffer 1993), allows another insight into the early European perception of the Cape and its people. Although sketches, they offer a fairly detailed depiction of some of the local and still economically independent native groups and the material culture they brought with them during visits to the Cape of Good Hope around 1700 (Smith 1995). These images could be considered as very early examples of the latter European interest in describing in detail the exotic landscapes and inhabitants of Africa and the New World during the period of the Enlightenment (see Trigger 1992).

During the period of the Enlightenment, around the mid to late eighteenth century, some of the most detailed accounts of the Cape Khoi people, their customs and material culture were produced by one of the most brilliant European minds to visit the Cape, namely Robert Gordon. Not only did he record valuable ethnographic observations in the form of written texts, drawings and water colours of people, their settlements and activities (Raper & Boucher 1988; Cullinan 1992), he also made the earliest archaeological observations of the western Cape (e.g. Cullinan 1992: 78). For instance, Robert Gordon recognized that many of the shell heaps around Eland's

Bay (Baboon Point) were not the result of natural processes or that of animal activities, but that of "Strand Bosjemans" (Raper & Boucher 1988: 402). His mind was indeed very acute, and therefore it is also not surprising that he was also the first European to remark on the existence of rock paintings (Raper & Boucher 1988: 84). This particular production of native art seemed to have been completely ignored by other explorers despite the many journeys that had taken them into territories where rock art is fairly common and of considerable antiquity (for instance, the Olifants River Valley).

ARCHAEOLOGICAL RESEARCH IN THE WESTERN CAPE:

The first archaeological survey along the west coast, from Namibia to the Cape Peninsula, was undertaken only a few decades ago, between 1950 and 1963, by Jalmar and Ione Rudner (J. Rudner 1968). As a result of this extensive reconnaissance, which also included areas within 19 km from the shoreline, it became clear that a large number of archaeological sites dotted the coastal landscape. More or less at the same time, the Rudners, T. Johnson, P. Sieff, H. Rabinowitz, T. Maggs, B. Trew and G. Hoehn were encountering numerous sites in the mountainous surroundings and along the Olifants river valley (Johnson *et al.* 1959; Maggs 1967; Parkington 1987a). Many of these sites contained archaeological deposits, but the main attraction was the numerous rock paintings, many of which depicted groups of human figures, elephants and therianthropic representations (Maggs & Sealy 1983; Manhire *et al.* 1983; Yates *et al.* 1985).

In May 1968, J. Parkington and collaborators started one of the first archaeological excavations in the western Cape at the site of De Hangen (Fig. 1.1). It was hoped that this site would provide a sequence of several millennia for the area and guide further archaeological research, much as other excavations and descriptions of site sequences made during the sixties by Janette and Hilary Deacon had done for the eastern Cape (Deacon & Deacon 1963; J. Deacon 1972). Unfortunately the site of De Hangen turned out to be fairly shallow, and its occupational history short-spanned (Parkington & Poggenpoel 1971). Nevertheless, the presence of marine shells at this site and the particular theoretical perspectives that were directing the interpretation of the excavated material prompted the research team to envisage inland and coastal areas as segments of the same subsistence round and settlement system. This bold suggestion took the shape of what was later known as the "seasonal mobility hypothesis" (Parkington 1972).

The interpretative framework used by J. Parkington at that time was explicitly ecological, as was also the case with other archaeologists in southern Africa (e.g. H. Deacon 1976). It was assumed that economic and technological aspects of hunter-gatherer life, and their movements in the landscape, were dictated primarily by the geographic distribution of food resources and their seasonal fluctuations, as well as the availability of suitable places to stay. In other words, the environment was the main factor that shaped hunter-gatherer life style. Consequently, palaeoenvironmental studies became more relevant to archaeological studies than ever before. Clearly recognized by Parkington himself (Parkington 1987a: 4-6), much of this perspective was due to the prevailing influence of the research of British archaeologist Eric Higgs (Higgs & Vita Finzi 1966; Higgs *et al.* 1967). During the sixties, ethnographic observations made amongst Kalahari hunter-gatherers, and elsewhere in the world (Lee & De Vore 1968), showed a certain degree of correspondence between fluctuations of water and food resources in time and space on the one hand, and the movement of people in the landscape and concomitant changes in social dynamics on the other. These observations also made a substantial imprint on Parkington's formulation of archaeological hypotheses (see also below).

The ecological perspective was rapidly becoming the new glass through which most archaeologists working in southern Africa were viewing the results of their analyses based on museum collections, surveys and excavations (see Mazel 1989; J. Deacon 1990). This local re-orientation of research designs and objectives was, in fact, the reflection of a world-wide change in archaeological interpretation. During the sixties, the culture-history and functionalist perspectives were being replaced by another interpretative framework (processualist), in which a more anthropologically informed outline of research (Binford 1962, 1965) was re-defining questions, methods, definitions and interpretations (see Trigger 1992). This trend in archaeology later became known as the "New Archaeology". Archaeologists working in southern Africa were, clearly, not exempted from the increasing influence that the New Archaeology was exerting on the Anglo-American world.

As a consequence of the excavation and analysis of the De Hangen material, and subsequent excavations in the Cape Fold Belt at Klipfonteinrand (Thackeray 1977), the coastal margin and Sandveld were targeted for further field work. Excavations proceeded at Eland's Bay Cave and Diepkloof shelter (Fig. 1.1) between 1970 and 1973, with the explicit purpose of testing the hypothesis of hunter-gatherer seasonal movements between the coast and interior mountains (Parkington 1987a: 6). A detailed survey of archaeological sites along the coast between the Olifants River and Berg River mouths was also an integral part of this enquiry. The qualitative and quantitative results obtained from the analyses of Holocene faunal material of Eland's Bay Cave, and the observations regarding size and content of the many shell-bearing sites along the coast, provided a good case for a transhumant pattern between the coast and interior mountains (Parkington 1976a,b).

Clearly, mobility and seasonality were the key issues at an early and later stage of research in the western Cape. Subsequent to the first work at Eland's Bay Cave and surrounding coastal strip, these important research considerations led to further testing through additional field work at the coast and various localities in the interior between 1976 and 1984. This time, field work included not only the excavation of several other rock shelters and shell middens, but also the recording of rock paintings, the quantitative analysis of stone tool scatters found in large and small open sites and the collection of palaeoenvironmental data. The results of this major effort of archaeological research was published as a two volume monograph entitled *Papers in the Prehistory of the western Cape, South Africa* (Parkington & Hall 1987).

As a considerable number of observations were being amassed and attempts were made to make sense out of them, time and space were conceived as sampling dimensions where human behaviour was represented (Parkington 1980). It was suggested that a place was not any space, but a locality which had been chosen by people for reasons related to a particular set of activities and to be undertaken in a particular environment. Thus, as an example, a number of broadly contemporary sites with differing assemblages need not necessarily reflect the presence of different "cultures". Rather, it was suggested that each of these assemblages was the result of different types of activities carried out by the same population of hunter-gatherers. Subsistence and technological needs were not the only imperatives that were suggested to have impinged upon hunter-gatherer decisions to visit a site. Social needs for large gatherings of family groups where information, gifts and personnel are exchanged, and important communal rituals are performed, were also considered as important motivations for choosing a site as a place (Parkington 1977; Manhire *et al.* 1983). The time dimension was pointed out as relevant when sites would have changed their character or purpose during successive re-occupations, thus becoming, effectively, other places. As a consequence of this reorganization of the settlement system, it was proposed that other sets of activities were performed around the same physical spots, leaving behind a different assemblage in the respective archaeological records. Reasons behind the decisions by which the character of sites was changed were largely attributed to fluctuations in the environment.

At this point, it is important to outline the chronological and theoretical contexts in which the concepts of time and place were developed. During the forties and fifties, the functional approach had largely, although not entirely, succeeded the culture-historical approach in North America and Europe (Trigger 1992). The later perspective regarded contemporary sites as parts of networks in which each played different and complementary roles, with the environment as one of several factors exerting influence in the strength and shape of these networks (Trigger 1968, 1992). Subsequently, during the sixties and seventies, and whilst the New Archaeology was gaining impetus (see above), changes in settlement patterns and interassemblage variability across space and/or time became an increasingly frequent subject of discussion in Anglo-American academic circles (e.g. Trigger 1968; Binford 1973). It was also during these same two decades that a number of ethnographic observations of hunter-gatherer groups were made around the world. Many of these studies became quickly available to the academic community in the form of books and articles in international journals (e.g. Lee & De Vore 1968; Damas 1969; Leacock 1978; Lee 1979).

Binford, as the most energetic proponent of the New Archaeology, observed that ..."archaeologists had already made significant progress in using knowledge derived from the physical and biological sciences to interpret those aspects of the archaeological record relating to technomic behaviour, especially subsistence pattern and technological practices" (Trigger 1992: 299). He sensed, however, a gap in the knowledge about activities, the use of space and material culture, amongst living hunter-gatherer groups. He firmly believed that such observations could be used by archaeologists to infer human behaviour from the archaeological record. Binford, like several of his contemporaries, assumed a high degree of regularity in human behaviour across time and space, and therefore found no problem in the use of ethnography of living hunter-gatherers for the interpretation of the past, before food production. Consequently, it is not surprising that he also believed that archaeologists should be trained as ethnologists. This was a strong conviction that prompted himself and others to undertake ethnographic fieldwork which was explicitly designed to answer archaeological questions (e.g. Yellen 1977; Binford 1978; Meehan 1982). Thus, processualist archaeologists made an effort to establish the behavioural relationship amongst sites ("places"), much as functionalist had also previously attempted, but by finding correlates with living examples of hunter-gatherer behaviour and by undertaking explicit hypothesis testing through quantitative analyses (e.g. Binford 1980). They also emphasized that the environment played an important rôle in determining directly or indirectly aspects of human behaviour, such as the choice of a site at which to stay. Thus, the concepts of time and place formulated by J. Parkington were shaped in the midst of the development of a new approach and research direction in Anglo-American archaeology.

The numerous rock painting images recorded from the mountain and Sandveld areas of the western Cape were analysed for their content and meaning (Yates *et al.* 1985), and the recurrence of particular types of motifs amongst them were studied in terms of their geographic distribution (Manhire *et al.* 1983). It was soon realized that part of the spatial variability in the rock art images of these two areas could be explained as alterations in the choice of "places" through time (Parkington 1987a: 13). The larger number, greater incidence and complexity of better preserved images in the mountainous interior were suggested to reflect a retreating frontier of residual hunter-gatherers. This phenomenon was thought to have happened as a consequence of the expanding presence of incoming pastoralist groups to the Sandveld in the western Cape around 1800 years BP (Parkington *et al.* 1986). When it was suggested, this hypothesis seemed also to be supported by the available observations regarding changes in the distribution, content and size of sites in the coastal Sandveld before and after 1800 BP. Nevertheless, none of the paintings recorded in both the mountains and the Sandveld had been securely dated. In sum, subsistence, residential preferences and behavioural aspects of local hunter-gatherer groups were suggested to have changed substantially as a result of contact with a different and dominant society, such as stock-keeping groups.

During the late seventies and beginning of the eighties, a new methodological dimension was added to the reconstruction of prehistoric settlement and subsistence patterns of the western Cape. This new window of opportunity was opened by N. van der Merwe in a series of pilot studies on stable carbon isotope analyses (Parkington 1987a: 14). These attempts led to the formalization of a project designed to test the seasonal mobility hypothesis via the isotopic analysis of human skeletal material recovered from burials in the western Cape (Sealy & Van der Merwe 1985; Sealy 1986). The initial results, and those of subsequent analyses on a larger number of skeletons (Sealy & Van der Merwe 1988; Sealy 1989), did not give support to the suggestion of a transhumant settlement pattern between the coast and interior mountains over the last 4000 years. Making sense of this apparent discrepancy has become a long-lasting challenge to archaeologists working with the pre-colonial history of the western Cape since the mid-eighties.

During the eighties and early nineties, studies regarding the pre-colonial history of the western Cape (as a whole) started to become involved with research into the archaeology of herders, dating to the last 2000 years. Aspects related to the nature of contact between herders and local hunter-gatherers were of particular interest at that time (e.g. Parkington 1984a; Parkington *et al.* 1986; Smith 1984, 1986, 1987, 1990; Klein & Cruz-Uribe 1989; Webley 1992). Some of these (Parkington 1984a; Smith 1990), and later contributions (Smith *et al.* 1991), were stimulated to a large extent by the challenging thoughts of Carmel Schrire (1980). She suggested that the difference between "herders" and "hunter-gatherers" in the archaeological record of southern Africa becomes blurred to the eyes of the scholars, because these categories are not valid for defining two different ethnic groups. Schrire proposed instead that these entities were more useful for the description of class differentiation amongst indigenous groups.

Theoretical and methodological considerations arising from this controversy (Schrire 1992; Yates & Smith 1993) contributed local insights to the world-wide "revisionist debate" (see Kent 1992 and references therein.). This debate had anthropologists engaged in a lengthy discussion about the cultural and economic identity of present-day (often referred to as "typical") hunter-gatherers. This discussion revolved mostly, although not exclusively, around southern African groups living in the Kalahari. According to Kent (1992), most of this polemic has been due to "... a general lack of appreciation of the amount of diversity present among Basarwa [or San] groups, ..." on both sides of the debate.

Parkington *et al.* (1988) produced the more recent comprehensive synthesis of the archaeology of pre-colonial hunter-gatherers in the research area. As with other histories of research, the impression gained from this summary paper is that many more questions were raised during the years following the excavation of De Hangen in 1968 than before archaeological investigations in the western Cape had started. Most of these questions could only be answered with a better refinement of the archaeological sequence of the study area along both the spatial and chronological dimensions. Equally important was the need to integrate the skeletal (archaeometric) and site-based (archaeological) reconstructions of diet.

The subsequent years of research in the western Cape (south of the Olifants river) have seen the continuation and termination of projects initiated during the eighties (e.g. Avery 1990;

Halkett 1991). The recording of rock art in the mountain area has been continued by members of various institutions, a few small scale excavations of rock shelters in the same area have been undertaken (Nackerdien 1989; Van Rijssen 1992; Evans 1994; Manhire pers. comm.), and the material excavated during the seventies from Andriesgrond Cave located in the Olifants River valley has also been re-analysed (Anderson 1991). However, in comparison with the Cape Fold mountain region, the coastal areas have received much more attention, as reflected by a larger number of projects related to shell-bearing sites. Most of these research efforts have been channelled towards the excavation and analysis of the material recovered from a site known as Dune Field Midden (Parkington *et al.* 1992 and references therein). This open site seems to represent a few weeks long visit, and several radiocarbon dates suggest a probable age of 650 years BP. Of particular interest in this project has been the detailed study of the spatial distribution of hearths and other site features in relation to that of food residues, concentrations of stone debris and potsherds, amongst other items. Other projects relevant to coastal settlements consisted of experimental work related to the processing and preservation of animal meat by very simple means (Smith *et al.* 1992; Henshilwood *et al.* 1994). Although this new set of observations obtained from coastal and interior sites provided important information about the behaviour of pre-colonial inhabitants, no serious attempt was made to articulate them in a general reconstruction of the western Cape archaeological sequence. Hence, no correction of the most deficient aspects in the previous interpretation of this particular record were undertaken and/or published.

In order to head towards this objective, two tasks need to be undertaken. One is the building up of more observations resulting from the excavation of additional and contemporary sequences, and the other involves the use of alternative ways of making sense out of the resulting observations and those obtained in previous years.

A CRITICAL ASSESSMENT AND THE OUTLINE OF AN ALTERNATIVE APPROACH:

Frequently, different basic assumptions are at the source of varying interpretations of the archaeological record. And, unavoidably, basic assumptions are also often present in the uncritical use of theoretical and "factual" considerations in the reconstruction of past events, as well as in the planning of further research objectives. The testing of basic assumptions and interpretations frequently involves a search for coherence within the growing body of observations, and between this and the interpretative frameworks employed. Alternatively, a critique of assumptions can also consist of a discussion about whether or not these were justifiably made via a more theoretical dialogue.

Unless the construction of parallel and apparently equally valid histories of past societies is to become a widespread objective amongst archaeologists, the testing of assumptions and reconstructions remains essential for improving our understanding of the archaeological record. Nevertheless, differing interpretations can remain as competing versions of the past, so long as there is a willingness to resolve the impasse between these two versions with further studies. Consequently, in order to extend the frontiers of our knowledge on the pre-colonial past of the western Cape, a critical assessment of previous interpretations has to be undertaken. This exercise involves the search for possible inconsistencies and gaps at the level of the empirical base, and an appreciation of previously held conceptions of pre-colonial societies concerning their ability to change and the circumstances under which such change might have occurred. Because of reasons of text space, this critique would only touch general aspects of theory and empirical observations. Details of these is the matter of the following chapters.

Normative thinking and the use of ethnographic analogies

"Normative thinking or normative treatment is that which seeks to identify typical or average behaviour and occurrances" (Claassen 1991: 249). By adopting this line of reasoning, the archaeologist is inclined not to recognize a significant degree of variability in the archaeological record, either through time or across space. As a consequence, normative concepts ..."impart a false sense of knowledge upon which successive interpretations are built" (Claassen 1991: 284). In these kinds of studies, the emphasis would be often placed on general laws of behaviour based on present-day examples borrowed from the natural and social sciences. The rescue of variability from the archaeological record, however, has several implications. Among the most important are those directly related to dating, sampling and other methodological procedures, all of which are potentially capable of allowing a reinterpretation of particular regional sequences.

For instance, a clear example of normative thinking applied to the archaeology of the Eland's Bay and Lambert's Bay areas was the coining and use of the term "megamidden". Although originally recognized as different from other nearby shell middens because of: i) their common large size, ii) frequent location behind rocky intertidal platforms, iii) apparent dominance of one species in their shellfish composition, iv) their lack of other faunal and cultural remains, and v) their chronological clustering between 3000 and 2000 years BP (Parkington 1976b; 1987a), megamidden became a monolithic category of archaeological site that was largely homogenous in composition. The sampling of a very small number of megamiddens gave archaeologists sufficient confidence for generalizing about their purpose in pre-colonial settlement and diet (Buchanan 1988; Parkington 1991; Henshilwood *et al.* 1994). These particular generalizations might have been justified at the time when they were originally made. However, successive inferences and interpretations were elaborated on unverified observations of megamidden contents, which were based on very small sample sizes (Parkington 1991; Henshilwood *et al.* 1994). Further sampling became increasingly necessary as questions regarding their apparent homogenous composition became more relevant.

But perhaps the most pervasive example of normative thinking in the archaeology of the western Cape, and that of southern Africa and the world, has been the use of ethnographic analogies. An early note of caution regarding this practice was made by H. Deacon when commenting that, "[i]t is perhaps in permitting a view of the time depth of the adaptations shown by populations genetically related to the present-day Kalahari Bushmen in somewhat more diverse habitats that a test is made of the degree to which such generalizations are meaningful" (H. Deacon 1976: 159). In subsequent years, J. Parkington made a call to "de-!Kung" archaeology, because until ..."we expect that things were different [in the past], we will always discover that they were the same" (Parkington 1984a: 172). Despite these wise comments, ethnography has became one of the main sources for archaeological interpretation in southern African archaeological research. As a consequence, "[t]he theoretical and methodological approaches to San ethnography ... tended to treat hunter-gatherers and the ethnographic present as an evolutionary stage, which [was] uncritically extended back in time. The past [was] seen as an image of the ethnographic present"..., giving "rise to weakly developed diachronic perspectives which mask[ed] archaeological variability" (Hall 1990: 4).

There are numerous archaeological examples from southern Africa that are absent from the ethnographic accounts of "typical" hunter-gatherers of the Kalahari. For instance: i) the use of caves, ii) the re-use of abandoned sites, iii) the presence of "caches" unrelated to subsistence activities and predating the introduction of pastoralism (personal observation from Steenbokfontein Cave), iv) the use of bone and shell artefacts such as "fish gorges" and "Donax scrapers" (see Schweitzer & Wilson 1982), v) the painting of rock surfaces (e.g. Johnson *et al.* 1959; Lewis-Williams 1981), and vi) the use of nets and recurved bows as depicted in the rock art of the western Cape (Manhire *et al.* 1985). A careful reading of the ethnography shows also that substantial variability occurs amongst Kalahari hunter-gatherers (Barnard 1992), and between these groups and some of those in the northern Cape (Deacon 1986, 1988). Moreover, subsistence and other activities amongst foragers leading towards the accumulation of large sites such as the "megamiddens" have not been described by ethnographers either. This ensemble of observations points to the concrete possibility that at least some hunter-gatherer groups in the past might have displayed a range of configurations in their economy and social organization which were at variance with the lifestyle of present-day Kalahari groups.

These ideas might find resistance amongst a number of archaeologists. Many would argue that since hunting and gathering have been the principal means of subsistence amongst southern African "foragers" for thousands of years, there seems no reason to suspect that their past might have been qualitatively different to that of the Kalahari groups (see Mazel 1989: 15-35). Such a suggestion is based on the incorrect assumption that the continued presence of hunted and gathered (wild) foods in the archaeological record reflects the same type of economy and social organization. As discussed by several archaeologists (e.g. Bender 1985; Mazel 1989; M. Hall 1987; S. Hall 1990), the means of production do not determine a specific mode of production. In other words, "what" you eat does not directly determine "how" you procure for your subsistence. This consideration has significant implication in the interpretation of the archaeological record before food production.

Inevitably, another outcome of viewing the past as little different from the ethnographic present has been the viewing of hunter-gatherer societies as essentially passive and reluctant to change, unless strong external forces (usually environmental change and/or contact with food producers) impinge upon them. In other words, there has been the implicit assumption that hunter-gatherers were incapable of initiating changes within their social context (see Mazel 1989: 30), because their lives were mostly dictated by environmental variability. Social aspects of hunter-gatherer life should also be taken into account as important factors in shaping the archaeological record, as has been recognized by many archaeologists (e.g. Bender 1978; Price & Brown 1985; Mazel 1989; Hall 1990; Gero & Conkey 1991). This, however, should not proceed with the *a priori* exclusion of other variables, such as the environment and population numbers. To do so, would be to narrow the possibility of a critical and constructive dialogue amongst archaeologists of different theoretical orientations. When criticizing archaeological interpretations of an ecological-adaptationist inclination, it is also of great importance to test them systematically within their own realm of predictions via an improved assessment of past and present environmental records.

Changes in site contents (material culture and/or fauna) were being described as coincidental with the introduction of pastoralism into southern Africa (Deacon & Deacon 1963; J. Rudner 1968; Schweitzer & Scott 1973) at the time when archaeological research got underway in the western Cape. In this instance, changes in hunter-gatherer lives were recognized as a consequence of another external force, which was not directly related to fluctuations in the natural environment but to a contact situation. Parkington *et al.*'s (1986) paper dealing with hunter-gatherer and pastoralist contact in the western Cape was the first to suggest a social scenario (and mechanism) by which changes in the archaeological record (including rock art) were attained. At that time, this proposition was one of the few exceptions, amongst other explanations for diachronic change, offered by southern African archaeologists. The majority were dealing either explicitly or implicitly with concepts such as "diffusion", "adaptive responses" and "spontaneous" processes of innovation (J. Deacon 1984; see also Mazel 1989: 15-27). Nevertheless, although Parkington *et al.*'s (1986) reconstruction was based largely on social considerations, hunter-gatherers were viewed as essentially passive rôle players in their history of social transformation. They were either victims of acculturation or fleeing survivors from a contact situation. Where hunter-gatherers seem to have been granted some measure of control over this imminent change it was not over the nature or consequences of the change, but in being able to slow down the pace by physically avoiding the newcomers, along with reinforcing social mechanisms for the maintenance of group cohesion and identity.

Reconstructing the past: gaps and weak points

A small number of observations, or the absence of them within a sequence, usually limits archaeologists in their capacity for offering explanations for change. A clear example was the near absence of archaeological and palaeoenvironmental observations dating to between 8000 and 4300 years BP. This mid-Holocene absence of occupation in the research area was also mirrored by other regions in southern Africa where occupation was minimal (J. Deacon 1974). Based on this pattern, it was suggested that aridity, and the drowning of shellfish-bearing rocky shores due to a rise of 2 m in sea level, rendered the research area unattractive to hunter-gatherer settlement. Fortunately, recently dated material from a sediment core recovered from

Verlorenvlei coastal lake (Baxter pers. comm.) and from two archaeological sites (Kaplan 1994; Jerardino & Yates 1996) have started to fill this chronological gap. Further excavations and the analyses of the available materials dating to the mid-Holocene would add to and/or correct previous explanations for the apparent absence of human occupation in the research area.

Semi-complete records are perhaps more worrying because they give a false sense of evidence. One case is exemplified by "deflation hollows". These sites consist of fairly large stone artefact scatters located along the margins of rivers and coastal lakes in the Eland's and Lambert's Bay areas. Most of them are thought to have formed through a process of accumulation and subsequent deflation of the sandy matrix, thus consisting of archaeological palimpsests (Manhire 1987). On the one hand, it has been possible to classify and quantify large numbers of different types of stone artefacts from these sites. Unfortunately, on the other hand, the dating of these sites has not been possible, due to the lack of datable material recovered from secure contexts.

Nevertheless, because of the similarity between the stone tool assemblage of the deflation hollows and that of a nearby cave (Tortoise Cave) dating to between 4300 and 1800 BP, it was assumed that the former dated to the same period (Manhire *et al.* 1984; Parkington 1987a; Parkington *et al.* 1988). Although this conclusion might have sounded reasonable at the time when it was made, the period that should have been assumed to be contemporary with the deflation hollows is that which dates to between 4300 and *c.* 3600 (Robey 1984). This is because neither Tortoise Cave nor other cave sites located in the research area contained deposits dating to between *c.* 3600 and 1800 BP. Not realizing the weakness of this assumption, another assumption was built on top of it. Deflation hollows were then suggested to be contemporary with the megamiddens, which date to between 3000 and *c.* 1800 BP (Parkington 1987a; Parkington *et al.* 1988; Parkington 1991). This conclusion was based on two observations: i) both types of sites reflect a choice of open air settlement, and ii) because of their disparate site contents, deflation hollows were a logical "interior" complement to the megamiddens at the coast (Parkington *et al.* 1988: 32). The first observation is indisputable but, in the absence of organic remains in the deflation hollows, the second was a mere act of faith.

Another case of a semi-complete record is evident in the reconstruction of changes resulting from the arrival of pastoralist economy in the western Cape (Parkington *et al.* 1986, 1988; Yates *et al.* 1994). Attempts to compare the archaeological records from before and after the first series of contact situations were established by contrasting pre-3000 BP with post-2000

BP observations. This diachronic comparison was clearly not satisfactory, because very little was known from the millennium before 2000 BP. As mentioned above, no cave deposits had provided observations dating to between 3000 and 2000 BP, and megamiddens appear almost depleted of cultural remains due to the sheer quantities of shell remains. Beyond the fact that megamiddens ceased to accumulate, and cave occupation was re-assumed, archaeologists could not say what else had changed in coastal hunter-gatherer societies with the appearance of pastoralism. Many questions regarding various aspects of material culture and the exploitation of terrestrial resources during the centuries immediately before this contact period remained unanswered. The reason why this was not considered a problem by some archaeologists might be because it was assumed that the history of coastal hunter-gatherers had not changed significantly between 4300 to 2000 BP, despite the dramatic changes in settlement patterns observed during this period.

Normative thinking and the use of ethnographic analogies allowed also for certain methodological considerations, whilst others were not sought. For instance, although palaeoenvironmental studies have been central to archaeological research in the western Cape, little has been done regarding relative or indirect measures of population size. Changes in population levels within a continuous occupational sequence were invoked in different contexts for explaining changes in the archaeological record (Parkington 1980, 1984a; Parkington *et al.* 1986, 1988). These demographic inferences were mainly based on changes in the approximate size of sites and on the number of occupational episodes dated to within certain periods of time (e.g. Parkington *et al.* 1988: 26; Yates 1989). Although these suggestions seemed to make sense and appeared interesting, these were not confirmed or tested through another measure of population change. Buchanan's (1988) estimates of total nutritional yields represented in food residues of several shell middens might have been thought to provide such a measure of population size. Nevertheless, these could only offer an estimate of group size by assuming length and frequency of visits. Unfortunately, both of these variables are important dimensions in the reconstruction of population levels and should not be assumed to have remained constant over several millennia. Hence, a way should be found for hinting at these three variables (group size, length and frequency of visits), before further elaborations are made on earlier observations which are preliminary in character. As absolute numbers would be difficult to associate with any of these variables, some relative measure of these would offer an adequate estimate.

Certainly, important advances in the reconstruction of coastal environments present during the pre-colonial past have been made in the last ten years. Before 1990, the level of chronological resolution of these studies, however, had only allowed for the generation of a broad background against which human behaviour could be evaluated. The late-Holocene was viewed as fairly stable, particularly when compared to the mid-Holocene and the Pleistocene/Holocene transition. Subsequent studies, based on charcoal analyses and sea surface studies (February 1990; Cohen *et al.* 1992), presented evidence to the contrary. These research efforts confirmed what other palaeoenvironmental studies had already suggested for most of the southern Hemisphere (e.g. Suguio *et al.* 1988; Grove 1990; Falabella *et al.* 1991), namely, that a succession of important small-scale environmental fluctuations characterized the late-Holocene. Hence, it was soon realized that the palaeoenvironmental record had to be refined, particularly in those instances where important explanations regarding changes in subsistence and settlement were based upon it. This was particularly apparent with the study of sea level changes, since a single post-mid-Holocene sea level regression was suggested as the main factor promoting the build up of megamiddens and concomitant changes in settlement patterns (Parkington *et al.* 1988: 30). If an update shows that sea levels followed a more fluctuating pattern, and/or shows a lack of synchrony between a sea level regression and the appearance of megamiddens, this new set of evidence should prompt a revision of previous explanations. Another reason for refining the chronological resolution of this particular palaeoenvironmental record lies in the need to make it as comparable as possible to the temporal scale within which human decisions are made. If an empirical criticism of the implicit environmental determinism of the original explanation is to be made, increasing the chronological resolution of the palaeoenvironmental record seems a logical way to go.

Another consequence of uncovering variability in the western Cape environment (flora and fauna) expresses itself in the consideration of alternative ways by which coastal hunter-gatherers could have resolved their subsistence strategies. When this is not allowed, single scenarios or hypotheses end up being pursued. An example of this is the following.

Based on the early travellers' records and ethnographic observations from the Kalahari, Parkington (1972, 1976a, 1976b, 1977) suggested that geophytes were crucial resources in hunter-gatherer diet, particularly in the interior mountains. He also added that, because of this, and their changing availability over the year and accross the landscape, hunter-gatherers followed a mobile and seasonal settlement pattern between the interior and coastal fringe. In the latter region, several species of shellfish and other marine resources provided for the bulk of hunter-gatherer diet. Consequently, based on these and other dietary and metabolic reasons (Noli & Avery 1988), long residencial permanence was not considered as a long-term choice in hunter-gatherer settlement before the colonial period (Parkington *et al.* 1988; Parkington 1991).

The likelihood of seasonal transhumance throughout pre-colonial times would not only involve the undertaking of seasonality studies on a number of archaeological remains recovered from various sites. A proper assessment of the nutritional value, accessibility and reliability of a variety of plant and animal species (both marine and terrestrial), as well as the identification of possible methods for their preservation through simple means, could also allow for other configurations in the organization of subsistence and settlement. Such an effort is partly reflected in Sealy's (1986) thorough listing and characterization of a range of edible plants currently growing in the western Cape, and in recent experimental studies dedicated to methods for the preservation of animal meat (Smith *et al.* 1992; Henshilwood *et al.* 1994). Nevertheless, despite these important observations, seasonal transhumance was regarded as the most plausible solution to the organization of subsistence, without proving other alternatives wrong (Parkington 1991; Henshilwood *et al.* 1994).

Furthermore, alternative subsistence scenarios should not be regarded as unlikely just because geophytes and shellfish remains appear to be mutually exclusive in the archaeological record, or because geophytes are the most abundant plant remains observed from excavated material (Parkington *et al.* 1988: 33). Differential preservation of food remains (e.g. the survival of geophytes' fragments and obliteration of other plant remains consisting of soft tissue) was mentioned only briefly in discussions about subsistence within the frame defined by the seasonal hypothesis. This important taphonomic process was also not included in the final reconstructions of hunter-gatherer dietary mix, and no analyses of any sort were dedicated to test whether differential preservation did not play an important rôle in shaping the archaeological record.

As a corollary, it is suggested that the mismatch between the isotopic measurements on human skeletons by Sealy (1988) and the dietary reconstructions based on food-waste (see previous section), at least partly originates from many of the unsound assumptions discussed above. These two methods for reconstructing hunter-gatherer diet can no longer continue as parallel lines of investigation (see Parkington *et al.* 1988: 37), if bringing coherence in archaeological observations is one of the main objectives when reconstructing the past. Whilst increasing our understanding of the collagen metabolism might bring these two methods to produce similar results, expanding the number of observations and improving the methods for analysing food-waste would also go a long way towards this objective.

Conclusions

Normative thinking has been present in archaeological reconstructions of the western Cape, and the correction of this perspective should allow for alternative scenarios and also alternative ways for testing previous reconstructions. This excercise should be applied to all lines of enquiry involved in the reconstruction of the pre-colonial past, including those dedicated to the study of palaeoenvironment, settlement, subsistence and material culture.

Archaeology should be regarded as a kind of palaeo-ethnography, an avenue through which observations based on present-day hunter-gatherers should be complemented and extended. Ethnographic analogies could still be taken as a starting point from which probable scenarios could be suggested, however these should not remain unquestioned, but ought to be tested. Of equal relevance is the consideration of social factors in accounting for any observed change in the archaeological record. It is also suggested that the proposition of social scenarios is entirely compatible with the study of past and present environments. Palaeoenvironmental observations might confirm the former by establishing no temporal connection between human behaviour and environmental change.

Regarding the late-Holocene archaeology of the research area, a number of problematic assumptions have been made. These should no longer be considered as reasonable and ought to be tested in order to provide a more complete picture of the pre-colonial past. This challenge involves the generation of more archaeological observations, particularly for the megamidden period (3000 - 2000 BP). Knowing more about this period would allow a better understanding of what changed as a consequence of the arrival of pastoralism *c.* 2000 BP. Also, knowing more about the megamidden period would allow a better understanding of the chronological sequence of the different options of settlement before 2000 BP. In this aspect, Parkington's concept of "place" is still regarded as a useful tool in pursuing further research in the study area. Increasing the number of archaeological observations at any point in time during the late-Holocene should involve additional excavations and surveys, particularly in areas not targeted previously; the dating of many more occupational episodes from previously excavated sites and from those excavated for this thesis project; and new means to evaluate hunter-gatherer population levels and diet from the excavated food-waste material.

CHAPTER 3

PRESENT AND PAST ENVIRONMENTS

INTRODUCTION:

Previous models and hypotheses proposed for the prehistoric settlement patterns and diet at the south western Cape included concepts in which the environment, and changes in it, played a predominant rôle in the life of hunter-gatherers (Parkington 1972, 1976a, 1976b, 1977, 1984b; Buchanan 1988; Noli & Avery 1988; Parkington *et al.* 1988). Such reconstructions were then felt to be justified, as the relatively small collections of palaeoenvironmental and archaeological observations seemed to coincide in a cause-effect relationship. Fortunately, the range, number, and chronological resolution of palaeoenvironmental and archaeological records in the south western Cape have increased substantially in the last six years. Consequently, a re-evaluation of these hypothetical models now seems necessary in the light of the improved quantity and quality of the palaeoenvironmental record.

The study area can be defined as the coastal strip and adjacent plain between the Jakkals River (co-ordinates at mouth: 32°05'05"S, 18°18'50'E) and a few kilometres south of Eland's Bay (32°30'S, 18°20'E) on the west coast of South Africa (Fig. 1.1). Within these limits, typical examples of coastal ecotone are exhibited by the variety and great biomass of marine and terrestrial resources (mostly of easy human access) confined to limited geographical areas. This chapter provides a description of present and past environments. Special emphasis will be placed on those landscape features and resources likely to have been valuable or limiting for pre-colonial hunter-gatherers and herders. These descriptions were obtained from the literature, and also from collaborative work with several specialists. Further palaeoenvironmental reconstructions undertaken during the course of my thesis project are presented in Chapter 5.

PRESENT ENVIRONMENTS:

Oceanic and atmospheric patterns

The most important physical feature exerting influence on west coast environments is the Benguela Current. Surface waters flow adjacent to the coast in a north-north westerly direction, moving progressively off-shore towards latitude 20°S. On average, coastal sea surface temperatures in the Benguela Current reach lowest values (8-10 °C) during late spring and summer months (October-February) in association with upwelling events. Relatively warmer sea surface temperatures (11-14 °C) are observed during the rest of the year (Shannon 1985). Nevertheless, it is not possible to distinguish clear seasonality changes on sea surface temperatures at the west coast because of the mutually cancelling effects of coastal upwelling and summer insolation (Cohen 1993). One of the three upwelling cells reported south of latitude 29°S is located just south of the study area (Shannon 1985) on the northern edge of Cape Columbine (32°-33°S). The coastal upwelled waters bring enough nutrients to the surface to support a diverse and highly productive marine environment (Branch & Griffiths 1988).

Following an upwelling event and relatively calm weather "red-tides" can occur. This name refers to the reddish-brown appearance of the water due to massive phytoplankton blooms (Grindley & Nel 1970; Horstman 1981). Most of these episodes occur in summer between December and May, and might extend for hundreds of kilometres. Frequently, red-tides include toxic dinoflagellates, which can be trapped and concentrated in the filtering and digestive apparatus of various organisms such as fish, crayfish and mussels (Horstman 1981; Buchanan 1988). The ingestion of such organisms can prove lethal for humans and other animals due to the neuro-toxic properties of this poison (Dale & Yentsch 1978).

The prevailing winds over the Benguela region and adjacent continent are determined by the South Atlantic high pressure system (anticyclone) and by the eastward moving cold fronts (cyclones) across the southernmost portion of the African continent (Tyson 1986). The climate on the west coast is defined by the seasonal shifts and interplay of these two pressure systems. The South Atlantic high pressure system is well developed during summer months over the south-western Cape. Summers are characteristically dry with south and south-easterly winds and surface temperatures ranging from 19 to 34 °C. During winter, the anticyclone pressure system is weak, shifting its position northwards allowing cold fronts to move in the same direction. Most of the rain falls between April and September, ranging from less than 300 mm in the study area to 1500 mm in the Cape Peninsula further south (Fig 1.1). North-westerly to westerly winds are predominant and winter surface temperatures range from 8 to 19 °C (Tyson 1986). Despite the relatively low annual rainfall in the study area, the vegetation benefits greatly from seasonal coastal fogs, which are a product of moisture condensation in the air caused by the frequent cold sea surface temperatures during the dry summer months (Sinclair *et al.* 1986).

Wetlands and rivers: physiography and geomorphology

Between the Jakkals river and the Berg river two substantial bodies of water occur, namely the Verlorenvlei and Wadrifsoutpan (Fig. 1.1). Unfortunately, no detailed study of the Wadrifsoutpan system has been done to date. A small-scale study by Wiseman & McMurray (in press) describes it as a seasonal vlei of 3 to 4 km long, 1.25 km wide at its widest point when full, and a catchment area of 655 km^2. The major tributaries are the Lambertshoek River and Langvlei River, at the end of which Wadrifsoutpan is located. Seasonal changes in salinity take place mainly after the winter rains and the high evaporation rates during summer. The mouth of this vlei/saltpan is permanently closed to the sea by a sand bar (Wiseman & McMurray in press). Various gentle sloping sandstone hills of 100 to 120 m above sea level are located on both sides (north and south) of Wadrifsoutpan and Langvlei River (South Africa 1:50.000 map sheet, 3218 AB LAMBERT'S BAY, second edition). Immediately south of both Wadrifsoutpan and Langvlei River a high concentration of sandy wind-deflated hollows occur (Lancaster 1987).

The Jakkals River is a relatively short river (60.2 km long) that crosses the coastal plain with irregular flow, and has only one major tributary, the Peddie's River. The Jakkals River approaches the sea just north of Lambert's Bay, where it acquires the characteristics of a small vlei. This area is 1.5 km long, 0.75 km wide when full, and 0.5 to 1.5 m deep depending on the season. Today, this semi-permanent vlei is an artificially maintained feature, as a result of a 1.75 m high concrete wall at the river mouth (Wiseman & McMurray in press). In the past, the Jakkals River might have had an intermittent connection to the sea, impeded by a sand barrier most of the time. A number of gently sloping sandstone hills of 100 to 120 m high above sea level flank the river within the last 20 km to the sea (South Africa 1:50.000 map sheet, 3218 AB LAMBERT'S BAY, second edition).

Verlorenvlei is a coastal lake located in the Eland's Bay area. 13.5 km long and 1.4 km wide at its widest point (about 8 km from the coast), it covers an area of approximately 10 km^2 and has a maximum depth of 5 m. A narrow, sinuous channel 2.5 km long connects it to the sea, but a sand bar blocks direct access to the sea during most of the year. From time to time, the sea washes over this sand bar during storms and high spring tides (Grindley & Grindley 1987; Miller 1987). Changes in salinity occur as a result of the inflow from the five main tributaries entering Verlorenvlei (Eselshoek River, Krom River, Antonies River, Kruis River and Bergvallei River), rainfall and intermittent sea water intrusions from the vlei mouth, as well as evaporation (Sinclair *et al.* 1986; Grindley & Grindley 1987). Salinity levels decline with increasing distance from the sea. The lowest salinity values (2.6 parts per thousand) have been recorded at a distance of 6 km from the vlei mouth and further inland (Robertson 1980).

Semi-continuous outcrops of Table Mountain Sandstone (TMS) occur on the south bank of Verlorenvlei. On these steep slopes a number of caves and rock shelters can be found. A fairly flat plateau lies behind these hills, averaging some 120 m above sea level (Sinclair *et al.* 1986; Miller 1987). On the northern side and close to the vlei mouth an extensive dune field of probable Holocene age (Yates pers. comm.) can be observed. To the east of it, low lying sand flats of Tertiary or Quaternary age as well as large numbers of sandy deflation hollows also occur (Sinclair *et al.* 1986; Lancaster 1987) (Fig. 1.1).

The shoreline between Lambert's Bay and Eland's Bay is bordered by a pair of long littoral dune ridges, most of which are partially vegetated and sometimes deflated by the action of winds (Miller *et al.* 1986). Between the near shore dune cordon of Holocene age and the shallower Pleistocene ridge there is a flat area where several back-barrier lagoons and ponds were observed in the past and until recently. Two current residents of Steenbokfontein farm recall these bodies of waters as having been substantial enough for boating and use as the source of fresh water and waterfowl by nearby human settlements until a few decades ago. (H. Burger and S. Jackson pers. comm.).

Local vegetation and terrestrial fauna

The local vegetation is known as the Strandveld, which includes both Fynbos and Karroid vegetation types (Acocks 1953). This highly diverse vegetation of the Eland's Bay and Lambert's Bay areas is represented by: a) shrubs, dwarf shrubs with succulent leaves, and deciduous-leafed geophytes, which are found mainly on unstable littoral dunes; b) evergreen shrubs and clumps of succulent schlerophyll shrubs up to 3 m high, as well as drought-deciduous shrubs and geophytes found in deeper sands located inland of the littoral dunes. During winter, annual herbs and geophytes make up 40% of the total perennial vegetation in this environment; c) Perennial cover of restoid strandveld and lowland Fynbos (many species of which bear small fruits during late spring to summer months) can occur with more frequency as the distance from the sea increases. Dry mountain Fynbos species can be found on sandstone outcrops, represented by evergreen shrubland and woody scrub forest in gullies and shaded cliffs (Sinclair *et al.* 1986).

Sealy (1986) has listed the different indigenous plant foods available in the south western Cape. At least 42 species with edible roots/corms/tubers, 30 species with edible leaves and/or stems, 11 species with edible flowers or nectar, and 13 species with edible seeds, as well as 35 species with edible fruits were identified in this list. Nevertheless, despite this fairly high number of edible species, it is likely that only some of them were actually collected and consumed. There are several species of edible plants that can be identified as probably the most preferred species by precolonial people because of their wide distribution, access, availability and bulk mass. Amongst the most noticeable, several species of corms from the Iridaceae family were described by early travellers as important food items (Sealy 1986). The small creeping plant *Grielum humifusum* grows even in the dry land of the Richtersveld (northern Cape), were its thick slimy roots today constitute a staple food amongst rural people (Sealy 1986). Although not mentioned in Sealy's plant food list, frequent patches of at least two species of medium to large tubers of the Family Cucurbitaceae (*Kedrostis africana* and *K. capensis*) are also found across the whole Strandveld throughout the year (Bond & Goldblatt 1984; personal observation). Unfortunately, very little is known about these plants. According to G. Williamsen (pers. comm) some of the *Kedrostis* species are poisonous whilst others are edible. Fruits, leaves and tubers of several species of the Cucurbitaceae family (some of them poisonous) are regularly consumed by indigenous inhabitants of southern Africa (Fox & Norwood Young 1982). Many become edible after boiling and/or roasting in hot ashes. This technique was certainly known by local indigenous groups at the time of contact with European travellers in the seventeenth century (e.g. Schapera 1933: 131, 185). *Aponogeton distyachos* (colloquially named "waterblommetjie"), *Phragmites communis*, *Prionium serratum* and *Typha latifolia* ("papkuil") are ubiquitous around water bodies such as the Verlorenvlei and Jakkals River. *Trachyandra* spp ("hottentotskool") has a high protein content and kilojoule value, and is frequently found in the Sandveld and interior mountains.

The Strandveld and major river valleys are known historically to have supported a large and diverse fauna (Skead 1980), including: fresh water and estuarine fish; a high number of migrant and resident birds of different sizes; small mammals including carnivores, hare and hyrax (dassies); several species of tortoises and turtles; small solitary browsing bovids; medium-sized and large gregarious game such as eland, hippopotamus and elephant amongst the most important (Skead 1980; Sinclair *et al.* 1986; Skinner & Smithers 1990). Marshland vegetation (dominated by reeds) is present in all water bodies described above, but significantly so along the Verlorenvlei and coastal lagoons and ponds at Steenbokfontein farm (Sinclair *et al.* 1986; own observation).

Sandy beaches and rocky reefs: geomorphology and fauna

Today, long stretches of sandy beach dominate the open coastline between Lambert's Bay and Eland's Bay, as well as further south. A number of isolated sandstone rocky reefs of various lengths protrude along this shore. Throughout the year, but mostly between late spring and early autumn, several species of marine birds and seal pups are washed ashore on these sandy beaches (Parkington 1976b; G. Avery 1990). Most impressive is the presence of large quantities of kelp (*Ecklonia maxima*) and several species of invertebrates in various stages of preservation after heavy winter storms (personal observation). Whale and dolphin strandings have also been observed on sandy west coast beaches (Best 1982; Smith & Kinahan 1984). Intertidal sub-surface colonies of white mussels (*Donax serra*) dwell in these sandy beaches in great quantities. Two species of gastropods from the genus *Bullia* spp also occur frequently in these environs (Bally 1987).

There has been only one attempt to record systematically some of the rocky reef profiles within the study area (Buchanan 1988). Most of the rocky points between Lambert's Bay and Eland's Bay consist of low-angle rocky platforms, heavily exposed to wave action, except for the north-facing, prominent and steep reefs of Baboon Point (or Cape Deseada), and the flat sheltered reefs within Eland's Bay.

Small haul-outs of seals (*Arctocephallus pusillus*) have been observed on Baboon Point with an intermittent appearance in the last decades. Permanent and migrant colonies of marine birds can be observed along this stretch of coastline, the most visible being cormorants (*Phalacrocorax* spp), Cape gannet (*Morus capensis*), gulls (*Larus* spp), terns (*Sterna* spp) and Jackass penguins (*Spheniscus demersus*) (G. Avery 1990). Nevertheless, the greatest marine biomass is found on the productive rocky reefs in the form of kelp forest (*E. maxima*), marine fish, crayfish (*Jasus lalandii*), and large intertidal and subtidal mussel beds (*Choromytilus meridionalis* and *Aulacomya ater*, respectively), as well as extensive, though patchy, intertidal colonies of limpets (*Patella* spp) and seaweed gardens (Kilburn & Rippey 1982; Rebelo 1982; Buchanan 1988).

The rocky shore shellfish community between Lambert's Bay and Eland's Bay closely follows the reported distributions of species richness and biomass for equivalent shores elsewhere on the west coast (McQuaid & Branch 1984, 1985; McQuaid *et al.* 1985). In Eland's Bay particularly, the flat exposed reef of Mussel Point (Fig. 1.1) supports a large biomass of filterfeeders dominated by *C. meridionalis*. The north-facing shores of Eland's Bay (Fig. 1.1), in contrast, are sheltered, with a total estimated shellfish biomass one order of magnitude smaller than that of Mussel Point, and dominated by limpets (*Patella* spp). The west-facing shore of Baboon Point is steep and exposed to wave action. Its rock surface is extensive but largely bare of shellfish, the accessible biomass being equivalent to 25% of that on the Bay reefs. The molluscan fauna is dominated by mussels (*C. meridionalis* and *A. ater*) and limpets (*Patella* spp) (Rebelo 1982; Parkington *et al.* 1988). The shellfish community on the reefs of Grootrif and Malkopan, located between Lambert's Bay and Wadrifsoutpan (Fig. 1.1), are characterized by patchy colonies of limpets in the high and mid-intertidal, and dense beds of black mussels in the low intertidal and subtidal (personal observation).

The degree to which mollusc species of economic interest were accessible to pre-colonial people seem to have depended to a large extent from their vertical distribution in the rocky shoreline. Two of the most common species found in shell middens of the west coast, *P. granatina* and *P. granularis* (Buchanan 1988), have their distribution in the mid-intertidal, an area of easy access to people. In contrast, other less common species in archaeological contexts have a different distribution. *P. argenvillei* usually inhabits semi-vertical exposed rocks of the low intertidal, and *P. cochlear* colonies form a narrow belt along the upper subtidal on the seaward side of low-angle reefs exposed to wave action. *P. barbara* and *P. miniata* are mostly found in low-tide pools and in the subtidal, whilst *P. compressa* is adapted to cling exclusively to the stipes of giant kelp, thus remaining submerged most of the time. *C. meridionalis* are frequent to find in exposed shorelines. This species of mussel is represented in the mid intertidal by mussel beds of small sized individuals which are easy to gather, whereas large individuals clump together in the low intertidal and subtidal. *A. ater* (ribbed mussel) inhabits the low intertidal, and is most frequently encountered in the subtidal amongst kelp beds (Kilburn & Rippey, 1982).

Recent research undertaken on the west coast of South Africa (G. M. Branch, pers. comm.) showed evidence of significantly larger mean sizes of limpets on sheltered areas than those found in more exposed circumstances. It was proposed that limpets present on wave-beaten shorelines would have limited time for feeding and therefore less energy for growth. On the other hand, larger mean sizes of *C. meridionalis* (black mussel) are found on exposed shores in contrast to those found in sheltered reefs, where mean sizes are significantly smaller (Griffiths 1981a; Branch & Griffiths 1988). Similar trends in sizes of limpets and black mussels have also been noted in the Eland's Bay area (Rebelo 1982).

Growth rates of the filterfeeder *C. meridionalis* can be slowed down by high levels of inorganic sediments present in the immediate environment. In open coast natural environments, energy expenditure involved in the separation of nutritional from non-nutritional particles is greatest when high levels of water turbidity are reached. Such energy expenditure is ultimately to the detriment of energy spent on growth and can result in small sized animals (R. Griffiths 1980; C. Griffiths pers. comm.).

According to Van Erkom Schurink (1991) the annual reproductive cycle of *C. meridionalis* populations on the west coast is characterized by two major spawnings, one in late spring and summer, between November and February, and the second in late autumn and winter, between May and August. Accumulation of gonad material (before spawning) in 65 mm long *C. meridionalis* individuals can result in an increase in flesh weight 2.8 fold over the spawned condition (Van Erkom Schurink 1991). Limpets, in contrast to black mussels, show only one marked spawning season during winter, between May and July (Branch 1974). In the case of *Patella granatina*, mature gonads constitute 50% of the total flesh weight, whereas during the rest of the year they represent only 15 to 20 % of the total individual mass weight (Branch 1974).

DISCUSSION: RESOLVING HUNTER-GATHERER SUBSISTENCE

Relative to other coastal areas south of the Berg river and along the southern Cape coast (Fig. 1.1), both the Lambert's Bay and Eland's Bay areas have been regarded as "marginal", mainly because of their relatively low annual rainfall. Nevertheless, the stretch of coastline included in the research area displays various features that would have been very attractive to pre-colonial visitors.

At a geographic level, areas of coastal ecotone distributed along the Jakkals river, Wadrifsoutpan and Verlorenvlei, as well as around various back barrier lagoons would have provided a magnet for coastal settlement. The abundance and concentration of a diverse range of species and relative high biomass within circumscribed areas would have allowed frequent visits to this coastal region.

Fresh water sources would not have been confined to these main water bodies, but would have included seasonal streams and water basins formed in eroded bedrock (Manhire 1984; Wahl 1994) during winter. These alternative sources of water and the presence of several pulpy plants in the landscape (Sealy 1986) would, to some extent, have allowed hunter-gatherer settlement away from the permanent water bodies. Furthermore, as it is the case with coastal areas in general, a high water table must have been the norm in the research area during pre-colonial times (Bailey & Parkington 1988), except during very dry periods (e.g. the mid-Holocene "climatic optimum").

Even today, small bovids and tortoises are frequently encountered in the Strandveld. Because of their territorial behaviour (Skinner & Smithers 1990), small bovids would have been located and trapped with snares without much difficulty. Tortoises are very common and easy to collect. Their location is relatively predictable under restioid vegetation and amongst lowland scrub (personal observation). Faunal remains of both of these species are the most commonly found in the excavated sites of the Eland's Bay area (Klein & Cruz-Uribe 1987).

Plant food probably constituted the bulk of pre-colonial hunter-gatherer diet and was likely one of the most important sources of carbohydrates in the research area over the last few millenia (Sealy 1986). Large quantities of Iridaceae corms are frequently found in excavated sites (Parkington 1987a), a fact that highlights their relevance in prehistoric diet. But although these geophytes would have been collected at their best (bulk and taste) during late spring and summer, a great number of other plants could have been also gathered seasonally, as well as around the year (Sealy 1986, see above). Several of these species include roots and tubers, flowers and leaves, many of which lack of hard and resistant tissue. Kelp (*E. maxima*) and several species of algae could also have been collected from every day strandings at the beach or in the case of algaes directly from the rocks. These marine plants are a rich source of energy with comparable calorific yields to honey (Buchanan 1988: 123, 157). Unfortunately, as with many terrestrial plants, marine algaes would also decay rapidly after their discard in archaeological contexts. This probably explains the poor preservation and almost invisibility of many plant food remains in many archaeological deposits, particularly in open and semi-open (rock shelter) sites. Likewise, honey can also be considered in the category of "invisibles" (Buchanan 1988) when reconstructing precolonial diets.

But perhaps the most visible, predictable and easiest resource to exploit in the research area are the highly productive rocky intertidal shellfish beds. With the appropriate mixture of energy rich foods, approximately 180 g of mussels per adult person would provide the necessary daily intake of protein (Buchanan 1988). Shellfish gathering was probably undertaken every day during low tides. Exceptional catches of greater diversity of marine invertebrate species and larger individuals would have been possible once or twice a month during spring low tides. The only substantial limitation to the exploitation of shellfish was probably posed by red-tides likely to occur during summer months. Unless hunter-gatherers were aware of food storage techniques (Waselkov 1987; Henshilwood *et al.* 1994), shellfish consumption during summer should have declined markedly or consisted mostly of low-risk species, such as limpets (Parkington 1981; Parkington *et al.* 1988).

According to the literature (Parkington 1981; Buchanan 1987; Parkington *et al.* 1988), shellfish were considered initially as mainly an alternative source of carbohydrates during winter, at the time when the locally available geophytes were scarce, small and unpallatable. In a subsequent publication, Noli & Avery (1988) criticized Buchanan's (1987) palaeodietary reconstructions by arguing that shellfish should be considered as mainly a rich source of protein. This assertion was also supported independently by Erlandson (1988). In their work, Noli & Avery (1988) proposed that relatively long periods of settlement at the coast based on heavy shellfish consumption would have implied an unhealthy high protein diet rapidly leading to protein poisoning, and eventually death. Later on, Parkington (1991) followed this argument and suggested that protein poisoning could have been another factor that promoted large-scale seasonal movements between the coast and the interior, as a means to avoid such risk.

Nevertheless, settlement at the coast could have been extended temporarily to cover most of the year, and perhaps the whole year. For this to have been possible, adequate supplies of fat and starch should have been regularly obtainable by coastal hunter-gatherers. Smith *et al.* (1992) have recently shown with modern experimental observations that fatty seal meat and blubber could be stored for at least a month by using a simple technology. This technique and that of mammal meat drying, as well as the preservation of plant food, was already kown by dwellers on the southern African Atlantic coast and other local indiginous groups (Budack 1977: 8, 26; Schapera 1933: 181; see also Fox & Norwood Young 1982). Family groups could easily have supplied themselves with seal and/or whale fat by burying it on the beach in permanently wet sand or by drying it. Moreover, as mentioned above, mussels and limpets can increase their flesh weight by at least 100% as a consequence of the build-up of fat-rich gonads. These numbers are in sharp disagreement with the value of 50% quoted by Noli & Avery (1988). Shellfish, particularly mussels, can provide both protein and fats twice a year.

Implicit in the argument for short visits to the coast and protein poisoning is the assumption that hunter-gatherers relied heavily on Iridaceae corms for the obtaining of carbohydrates (Parkington 1976, 1991; Parkington *et al.* 1988). Perhaps, these dietary reconstructions have over-emphasized the rôle of corms in prehistoric diets at the south western

Cape. Besides corm casings and a few seeds and berries, the rest of the collected plant foods would hardly leave any identifiable or visible remains in archaeological sites, because of their soft consistency (Sealy 1986, see above). Consequently, the surviving archaeological record would likely reflect only a portion of the plant consumption of the past. The likelihood that prehistoric hunter-gatherer diet included a wider variety of plant foods than previously proposed (and as suggested here) does not prove that this was actually the case. Nevertheless, to assume that plant intake was mostly restricted to those species reflected in the archaeological record is to deny *a priori* possible subsistence scenarios without having proven them wrong.

The characterization of the research area as "marginal" is clearly debatable. Although this stretch of coastline and adjacent plain would probably not have supported the same demographic levels as those at the south coast, groups of hunter-gatherers could have subsisted adequately for most of the year around. It is also clear that the number of visitors would probably have depended upon fluctuations in oceanographic and weather conditions.

PAST ENVIRONMENTS:

Most of the palaeoenvironmental reconstructions presented here are gathered from sequences obtained for the south western Cape, particularly for the study area and immediate adjacent localities. Some of these sequences have been obtained by specialists whose interest in my project has led to collaborative work. Local sequences will be described, and then evaluated in the context of sequences obtained elsewhere for southernmost Africa. Possible mechanisms involved in the observed palaeoclimatic patterns will only be sketched, as a detailed discussion would constitute a dissertation topic in its own right.

Sea level change

The best radiocarbon dated evidence for sea level change on the south western Cape has been reported by Miller *et al.* (1993). The proposed sea level curve shows a mid-Holocene high between 6000 and 3500 BP, followed by a gap in the evidence for raised beaches from 3500 to 2200 BP, and a subsequent and progressive drop of sea level to its present position. This approximately 1300 year long time gap in the raised beach record could be an indication of minor but important sea level fluctuations during the late-Holocene, as the beach ridges dating to this period may have been eroded by subsequent high sea level stands at *c.* 2200 BP. These dated observations support previous palaeoenvironmental reconstructions based on

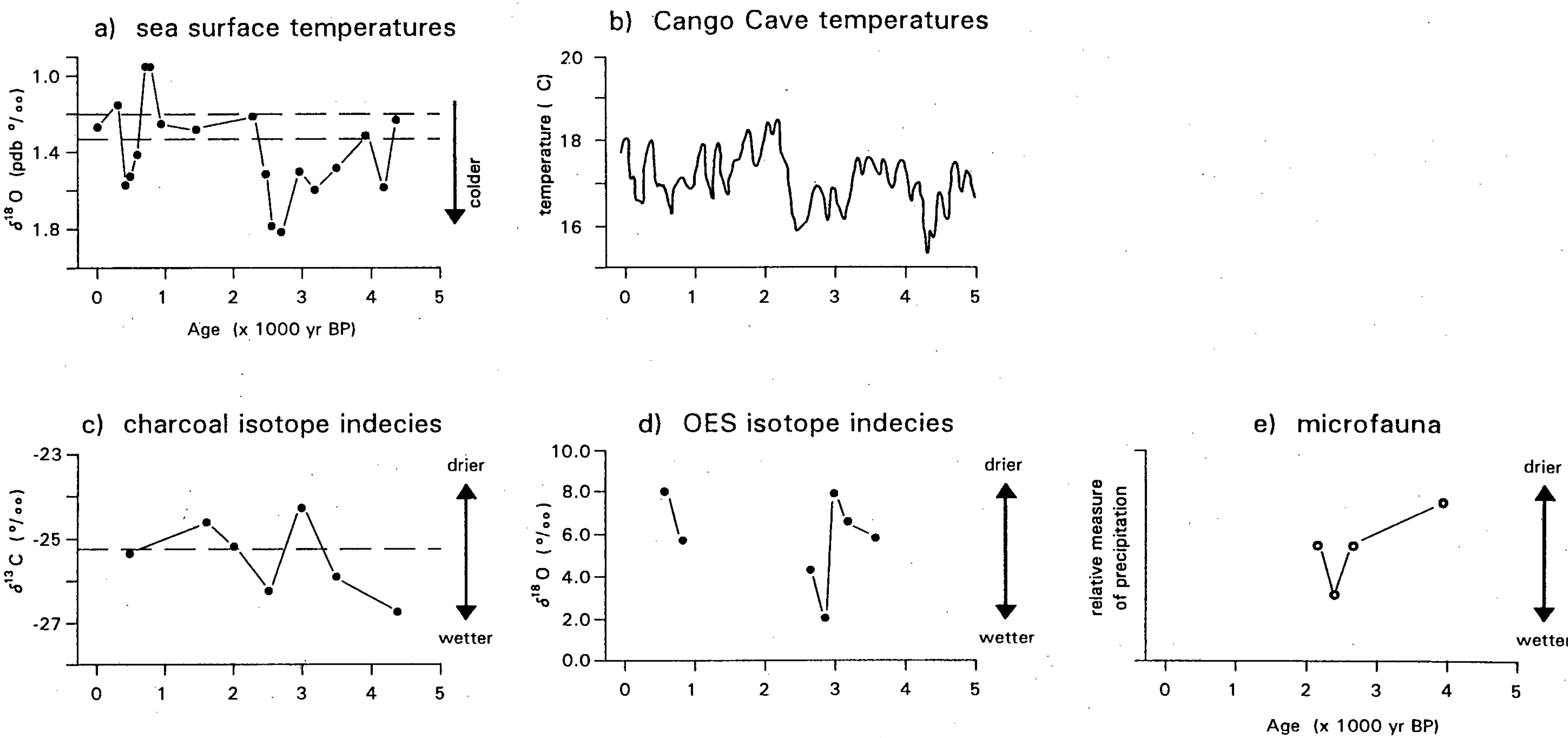

Figure 3.1: Weather parameters in the south western Cape during the last 5000 years. a) Sea surface temperatures for the southern Cohen et al. 1992 and own data. b) Temperature record of a speleothem at Cango Caves (after Talma & Vogel 1992). c) Stable isotope ratios of Diospyros archaeological charcoals from Eland's Bay (after February 1990). d) Preliminary results on oxygen isotope analyses of archaeological OES from Pancho's Kitchen Midden (after Lee-Thorp & Shackleton in prep.). e) Trends in precipitation at Lambert's Bay according to microfaunal analyses from Steenbokfontein Cave (Avery in prep.).

archaeological fish and shell remains which suggested a change from full estuarine conditions at the Verlorenvlei mouth to those of a coastal lake (Poggenpoel 1987; Robey 1987) around 3800 BP. Further evidence for mid-Holocene high sea levels as well as estuarine and salt marsh conditions 15 km inland from Verlorenvlei mouth have also been proposed by recent results of pollen analyses obtained from core samples (Meadows *et al.* 1994).

Sea surface temperatures

The only chronologically well resolved Holocene sea surface temperature record for the south western Cape has been obtained from *P. granatina* shells found in archaeological shell middens located in the study area (Cohen *et al.* 1992; Cohen 1993). Figure 3.1a shows this record with the addition of temperature values for 4230 BP obtained during the course of my thesis work by analysing four *P. granatina* shells from Malkoppan megamidden ($\delta^{18}O$ mean ± std: 1.58 ± 0.17; lab. nr. UCT-5073, 5081, 5086, 5088). Lowest average sea surface temperatures are reached at *c.* 4200 BP, from 3500 BP to 2300 BP, and again between 600 and 400 BP. Relatively warmer temperatures were established at 4330 and *c.* 750 BP.

Isotopic analyses of archaeological shells recovered from Nelson Bay Cave, located at the south coast, not far from the Cango Caves, provide a chronologically less resolved record of sea surface temperature (Cohen 1993). In this instance, the record of interannual variation in sea surface temperatures is the best obtained so far for southern Africa, but only seven individual shells dating to the last 4200 years were analyzed. This small sample size contrasts with the sixty six individual shells analyzed for the reconstruction of the southern Benguela sea surface temperature record (Cohen *et al.* 1992). The resulting average sea surface temperatures of southern Agulhas were consistently lower than today's local mean, the magnitude of the difference being 2.5 to 4 °C.

Temperature and rainfall

J. Deacon (1974) noted a marked decrease in the number of archaeologically derived radiocarbon dates between 8000 and 4500 BP in the south western Cape and part of the Karoo regions. This pattern has been interpreted as an occupational hiatus, indicating a period during which people hardly visited these regions. Lower rainfall and higher temperatures as well as rising sea-levels during the so called "climatic optimum" could in part explain this pattern (Parkington *et al.* 1988; Klein 1991). Contrasting with these suggestions, Cohen (1993) has recently concluded that conditions at the west coast could have been relatively wetter again around 5000 BP. Nevertheless, the significantly low number of coastal skeletons found dating to this period (Sealy & Van der Merwe 1988) does not seem to support this latter suggestion.

A well resolved sequence of palaeotemperatures has been established after analyses undertaken on a speleothem from the Cango Caves located in the southern Cape (Talma & Vogel 1992). Cave temperatures from the last 5000 years show marked cool events at 4300 - 4200 BP, several between 3100 - 2500 BP, and a short cold event at about 1300 BP, as well as two further drops in temperature in the last 1000 years (Fig. 3.1b). When reconciling the $\delta^{13}C$ data with the temperature record of the same sequence, the authors concluded that between 5000 and 2000 BP the seasonality of the rainfall tended more toward winter rainfall. Today, the Cango area receives rain on an all year-round basis (Tyson 1986).

As mentioned above, the south western Cape is situated in the winter rainfall region of southern Africa (Tyson 1986). Recent results from stable isotope analysis and the wood anatomy of the archaeological charcoals provide a preliminary record for the late-Holocene in this region (February 1990). Cooler and wetter conditions were inferred to have prevailed around 4200 BP and again between 3000 and 2000 BP in the Eland's Bay area (Fig. 3.1c). A high percentage of woody plants not found in this area today were recovered from charcoal samples contemporary with the cool and wet episodes mentioned above. A few kilometres south of Eland's Bay, a long coastal dune cordon described by Miller *et al.* (1993) exhibits a well developed palaeosol. A corrected shell date (own data) of 3080 ± 60 BP (Pta-5986) was obtained for the archaeological remains in close association with this buried organic horizon, thus recording a possible wet episode in the area during the late-Holocene. Similarly, according to palynological evidence from Cecilia Cave, an east-facing cave on Table Mountain in the Cape Peninsula (Fig. 1.1), relatively wetter and cooler conditions were present some time around 3000 BP (A. Baxter, pers. comm. 1993). Cooler and wetter conditions might also have prevailed until *c.* 2000 BP at the northern Cape coast, as suggested by the microfaunal evidence of Spoeg River Cave (D. M. Avery 1992).

Further observations on palaeotemperatures are provided by recent oxygen isotope analyses on ostrich egg shell fragments found at Pancho's Kitchen Midden and Eland's Bay Cave, both of which sites are located in the Eland's Bay area. These preliminary results show highly variable moister conditions between 4300 and 300 BP (Fig. 3.1d). A markedly wetter period was identified between 2900 and 2600 BP, and relatively more arid conditions than today were identified for the 3600 and 3000 BP period. Similar dry conditions were recorded from Pancho's Kitchen Midden within the last 1000 years, although a wet signal was obtained from Eland's Bay Cave with contemporary material (Lee-Thorp & Shackleton in prep.). This last observation is contemporary with an historical period known as the Little Ice Age. Tyson and Lindesay (1992) also described colder and wetter weather conditions over the south western Cape during this period.

Recent analyses of the microfaunal assemblage of Steenbokfontein Cave (south-western Cape coast) have yielded a detailed record of changes in the vegetation around the Lambert's Bay area between 4000 and 2000 years ago (D. M. Avery in prep.). Overall, the micromammalian evidence suggested relatively uniform conditions between 4000 and 2000 BP. Nevertheless, conditions appear to have slightly differed from the general trends on two occasions. During the first, at *c.* 4000 BP, vegetation seem to have been sparse and dry, suggesting that either rainfall was slightly lower than it is today and/or temperatures were relatively higher (Fig. 3.1e). The second event is characterized by dry closed bush at *c.* 2300 BP. Using modern analogues, the presence of this vegetation in the Lambert's Bay area would be indicative of higher rainfall than at present.

DISCUSSION: PAST ENVIRONMENTAL FLUCTUATIONS DURING THE LATE-HOLOCENE

Despite the still fragmentary palaeoenvironmental evidence, it would appear that the late-Holocene was characterized by important fluctuations in land and ocean systems in the south western Cape. These changes were considerably less pronounced than those experienced over the full glacial to interglacial cycle, but nevertheless, they would have allowed the extension or limited the number of visits and their duration.

Relatively warmer and drier conditions, as well as higher sea levels and estuarine conditions at the Verlorenvlei mouth would have characterized the research area around 4300 - 3800 BP. Subsequently, a number of broad contemporary palaeoenvironmental changes followed after 4000 BP. Colder and wetter conditions seem to have prevailed in the south western Cape between 3000 and 2000 BP and also during the last 1000 years. Moreover, negative temperature departures of 1-2 °C characterized sea surface temperatures during these two periods and during another previous cold event around 4200 BP. It is also possible that sea level would have already reached its present mark sometime between 3500 and 2200 BP, after the mid-Holocene high. These two periods dominated by cold and wet conditions over the last three millennia were contemporary with two well known Neoglacial episodes in the southern hemisphere (Grove 1990; Jerardino 1995b), the last of which is known as the Little Ice Age.

Cooler and slightly wetter conditions have also been suggested for the Transvaal Bushveld between 4000 and 2000 BP (Scott 1982a, 1982b), an area which is today included within the summer rainfall region of southern Africa (Tyson 1986). In the Kalahari region, humid episodes were contemporary with the above mentioned Neoglacial events in the south western Cape (Thomas & Shaw 1991). During these events, cyclonic frontal systems might have penetrated more regularly as far north and east as the central and southern Kalahari regions. Thus, moister conditions were brought to these regions, and to the south and south western Cape, between 3000 - 2000 BP, and within the last 1000 years. The Circumpolar Circulation driven by the westerly winds might have contributed by bringing cold subantarctic waters into the Benguela Current. As a consequence, sea surface temperatures were depressed by one or two degrees below the present average. This is reflected in the southern Benguela record (Cohen *et al.* 1992).

Part of this scenario is not in accordance with current climatological models for southern Africa, specifically, regarding the summer rainfall region (Tyson 1986). Cockroft *et al.* (1987) suggested that the underlying mechanisms shaping Holocene climatic conditions over southern Africa were analogous to those involved in wet and dry spells of near decadal duration documented within the recent meteorological record. According to this model, an increase in precipitation over the summer rainfall region should be accompanied by dry conditions over the winter rainfall region and visa versa. Wetter conditions in the summer rainfall would occur generally when temperatures were highest. On the other hand, wet conditions in the winter rainfall region would be generally accompanied by relatively cold temperatures. As stated by Cohen (1993), the Tyson (1986) explanation based on modern analogues, is not the only one currently available in the literature (Jury and Levey 1993; Jury and Pathack 1993). Thus, Cockroft *et al.*'s (1987) model needs to be contrasted with updated and reliable palaeo-data.

The evidence for wetter conditions in the Transvaal Bushveld, south western Kalahari, and part of the Karoo are in conflict with Tyson's (1986) model. The available palaeoclimatic record between 4000 and 2000 BP for these three subregions is fairly consistent. These are not the first observations to suggest that Tyson's model might not be appropriate within certain time slices. For instance, Cohen recognized that her inferred atmospheric circulation over the subcontinent during the Little Ice Age based on isotopic analyses on Nelson Bay Cave molluscs (Cohen 1993) is not in agreement with that proposed by Tyson and Lindesay (1992).

Although Cohen *et al.* (1992) could not distinguish between temperature changes induced by upwelling from variations in the input of the warm Agulhas Current, there are some additional indications supporting the first scenario. During one of the periods that experienced the coldest sea surface temperatures (3500 - 2300 BP), human settlement at the south western Cape witnessed the most intense period of shellfish exploitation in African prehistory, between 3000 and 2000 BP (Parkington *et al.* 1988). Huge shell middens (megamiddens) dating from this period are frequently dominated by tons of *C. meridionalis* mussel shells (Chaper 1 and 4). Current statistical analyses of their body sizes show no definite sign of their having been overexploited at the time of greatest deposition rates. In fact, many sites show increased mean sizes of black mussels during this millenium (Yates 1989; own data). At present, this situation would only be explained as due to a good supply of nutrients, dissolved oxygen and cold water temperatures (Griffiths 1981a, 1981b). Consequently, it is possible to suggest, that northward inputs of nutrient rich cold waters by the Circumpolar Circulation into the Benguela Current might have been relative frequent between 3500 and 2300 BP.

The proposed rôle of the Circumpolar Circulation in the depression of sea surface temperatures would also not find the support of several authors. Tyson & Lindesay (1992) suggested that the major cause behind cold sea surface temperatures in the southern Benguela Current during the last Neoglacial episode was due to a "weakening of the global thermohaline circulation transporting warm surface water in a conveyor from the Pacific via the Indian Ocean, round the Cape and so into the north Atlantic Ocean" (Tyson & Lindesay 1992: 276). Regarding the same data, Cohen *et al.* (1992) stressed the rôle of the oceanic thermohaline conveyor in the regulation of climate (Broecker & Denton 1989), but without confirming its actual relevance for past cold sea surface temperature events in the southern Benguela Current. In a subsequent attempt to resolve this point, Cohen (1993) proposed an ocean-atmosphere conceptual model tested via oxygen isotope analysis on archaeological shells from the southern Cape coast. In this model, Cohen (1993) suggested that strong westerlies are associated with a weak Agulhas Current, warmer sea surface temperatures in the southern Cape and concomitant warming of the southern Benguela Current due to advected Agulhas water. Additionally in this model, relatively strong westerlies were associated with wetter conditions over the winter rainfall region and with drier conditions over the summer rainfall region. Nevertheless, according to the empirical evidence gathered in this chapter, there seems to be a consistent, if not strong, case for wetter conditions during the neoglacial episodes coinciding with colder and not warmer sea surface temperatures, as expected by Cohen (1993). Nonetheless, Cohen's work constitutes a valuable set of observations, with no precedent in southern Africa. Present discrepancies in her interpretation can only be resolved with the collection of more data relevant to late-Holocene rainfall conditions over the western Cape.

The implications of this palaeoenvironmental reconstruction are very clear. The "marginality" that characterizes the research area today would not have posed significant restrictions to hunter-gatherer visits during those centuries marked by Neoglacial episodes. Wetter conditions would have favoured a higher productivity at all trophic levels and ensured good supplies of fresh water. Small streams could have flowed for a few months longer than today, and back barrier lagoons would have been larger and possibly more numerous than today. Marine productivity in general was likely to have been much higher than at present, due to the input of rich sub antarctic waters into the Benguela Current. The short periods around 4200 BP, and particularly between 3200 and 2200 BP and within the last 1000 years would have been characterized by propitious environmental and ecological conditions in the Lambert's Bay and Eland's Bay areas. Such favourable environmental conditions could have offered hunter-gatherers a variety of settlement choices.

CHAPTER 4

EXCAVATIONS: APPROACHES, STRATIGRAPHY AND DATING

INTRODUCTION:

Over the last twenty years of archaeological research in the Eland's Bay area, a substantial part of the late-Holocene cultural sequence was derived from excavations in cave sites and rock shelters. The most important of these excavations are those in Eland's Bay Cave, Eland's Bay Open, Spring Cave and Tortoise Cave (Fig. 4.1; Parkington 1977, 1981, 1987a; Horwitz 1979; Robey 1984, 1987; Klein & Cruz-Uribe 1987; Parkington *et al.* 1988). All these sites share two features: i) the absence of human occupation between 3000 and 2000 BP, and ii) locations restricted to the slopes of the south bank of Verlorenvlei and around Baboon Point (Fig. 4.1).

Archaeologists knew very little about the 3000 to 2000 BP period in the research area, because of the culturally impoverished deposits that characterize the middens dating to this period. During the initial development of the research programme for this thesis project it was recognized that most of the previous excavations had been restricted to sites located away from the most prominent megamidden in the Eland's Bay area (see below: Mike Taylor's Midden). It was suspected that this bias in excavation strategy might be a reason for the lack of observations for the megamidden period from caves and shelters. On the other hand, it was suspected that caves and rock shelters located behind and in the close vicinity of this megamidden contained deposits dating to between 3000 and 2000 BP, as these sites might have been part of the settlement system during the megamidden period.

A search for cave sites and rock shelters dating to the megamidden period was undertaken in two areas where few or no archaeological excavations had taken place: along the rocky outcrops south of Baboon Point (Fig. 4.1) and around the Lambert's Bay area (Fig. 4.2). As a first step, the site records collected by members of the Spatial Archaeology Research Unit (University of Cape Town) over the last 15 years were assessed. Sites that were recorded as more than just ephemeral occupations were revisited in the field. Subsequently, one rock shelter (Pancho's Kitchen Midden) and one cave site (Steenbokfontein Cave) were considered as the best candidates for a new excavation programme, the results of which are reported in this thesis.

This search also targeted the dunes of the coastal fringe where several open sites had already been found (Parkington 1976; Buchanan 1988). It was hoped that undetected

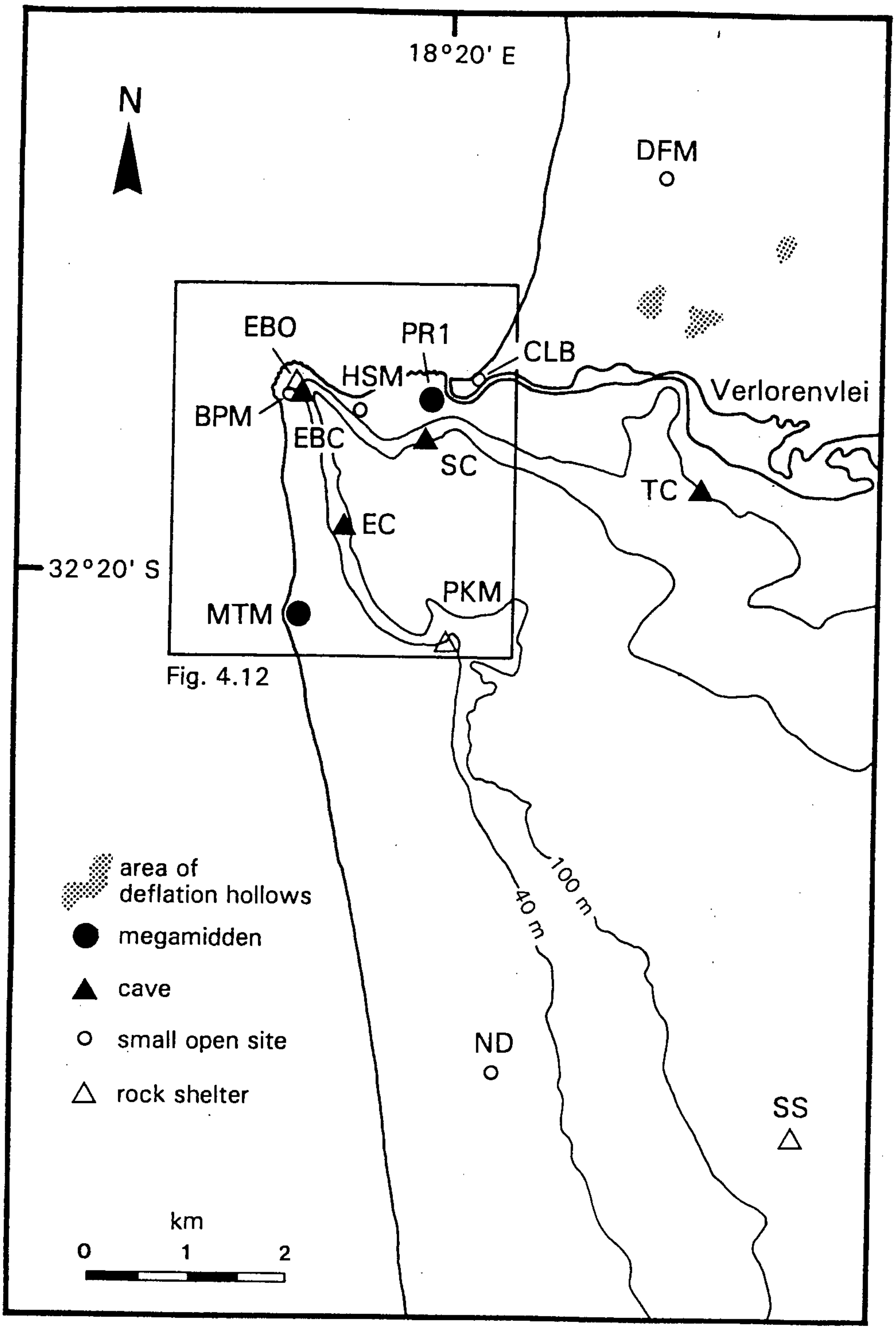

Figure 4.1: Geographic location of archaeological sites in the Eland's Bay area mentioned in the text. CLB Connie's Limpet Bar; BPM Borrow Pit Midden; DFM Dune field midden; EBC Eland's Bay Cave; EBO Eland's Bay Open; EC Eagle Cave; HSM Hail Storm Midden; MTM Mike Taylor's Midden; ND Nuwedam A; PKM Pancho's Kitchen Midden; PR1 Public Resort 1; SC Spring Cave; SS Scorpion Shelter; TC Tortoise Cave.

megamiddens or small open sites contemporary with them would be located. A field survey was undertaken for 16 km south of Mussel Point (Fig. 4.1) along the narrow and semi-vegetated dune cordon (Chapter 3). Another 9 km stretch of coastal dunes was investigated south of Lambert's Bay (Fig. 4.2).

Before this thesis project started, only a fraction of the known megamiddens had been sampled (Horwitz 1979; Yates 1989). In those instances where excavations had taken place, the number of test pits was very small (frequently only one) and the volume of excavated material often did not exceed a cubic meter (except on two occasions). Moreover, volume counts of excavated material were recorded in only a few cases. Consequently, the initial observations on megamidden deposits available at the onset of this project were regarded as incomplete and/or unsuitable for the research objectives of this thesis project, and a new megamidden sampling programme had to be developed. Some megamiddens needed to be re-sampled and the excavation also extended below the depth of previous test pits in order to check for older shell lenses, whilst others had to be excavated and dated for the first time. As an outcome of these considerations several test pit excavations were conducted in megamiddens located between Lambert's Bay and Eland's Bay.

Also at an initial stage of the thesis project, several new radiocarbon dates were obtained for Tortoise Cave (Jerardino 1995). As a result of these dates, the stratigraphy of this site was revised and all of their contents re-analysed according to this modified stratigraphic sequence. These analyses added several new observations to those gathered by Robey (1984, 1987) including those relevant to palaeoenvironments (Chapter 5), prehistoric human settlement (Chapter 6), and subsistence (Chapter 8). An additional number of radiocarbon dates were also obtained for several other sites excavated before the undertaking of this project.

The results of the revised stratigraphy of Tortoise Cave and that of the excavated and sampled sites, as well as observations from field surveys are presented in this chapter. All radiocarbon dates reported here are uncalibrated, and details about the dated material as well as laboratory numbers can be found in Table 4.1. Information regarding radiocarbon dates obtained for megamiddens and sites excavated as part of other research projects in the study area (Horwitz 1979; Parkington 1981; Robey 1987; Buchanan 1988; Noli 1988; Yates 1989; Parkington *et al.* 1992; Wahl 1994) are also given in Table 4.1.

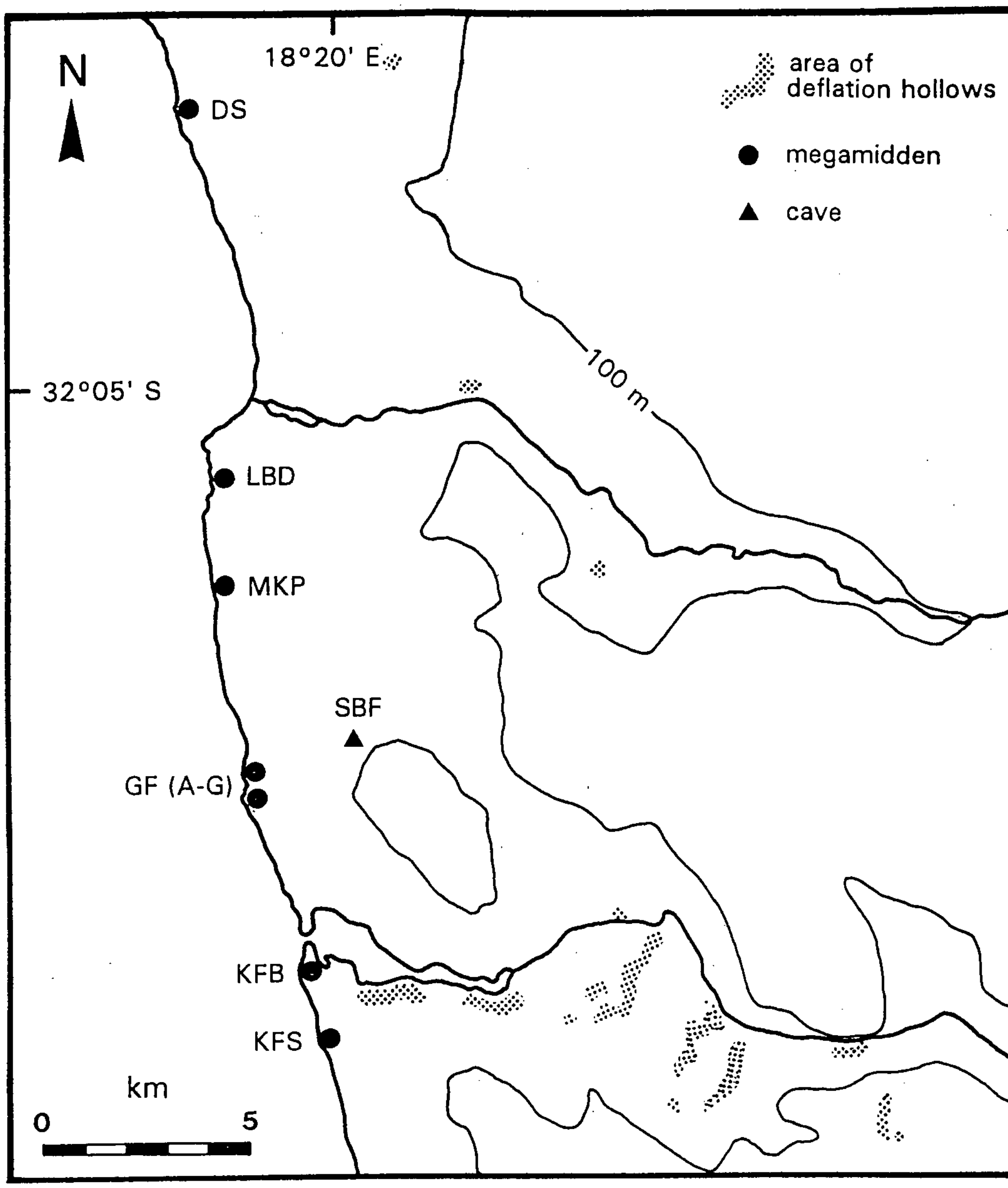

Figure 4.2: Geographic location of archaeological sites in the Lambert's Bay area and mentioned in the text. DS Doorspring; GF Grootrif; KFB Kreefbaai; KFS Kreefbaai South; LBD Lambert's Bay Dump; MKP Malkoppan; SBF Steenbokfontein Cave.

Table 4.1: Summary information of uncalibrated radiocarbon dates from sites relevant to this thesis project. All shell dates are corrected for the apparent age of sea water (-400 years). * = unreliable date (see text) ϕ = date obtained for this thesis project

SITE	LAYER	UNIT	SQUARE	MATERIAL	DATE (BP)	$\delta^{13}C$ $^{o}/oo$	SAMPLE NUMBER
TORTOISE CAVE	1a	FUB	J3	restoid reeds	760 ± 50	-23.4	Pta-3600
	2a	LEN	X2	charcoal	1660 ± 45	-24.2	Pta-5855ϕ
	2b	FRAN	K2	charcoal	1580 ± 50	-24.0	Pta-3309
	3a	KTAT	K2	charcoal	1590 ± 50	-24.1	Pta-5817ϕ
	3a	TURNER	Y2	charcoal	1610 ± 50	-23.5	Pta-3311
	3a	ABD II	J2	charcoal	1620 ± 50	-23.5	Pta-3310
	3a	ALVIN	X3	charcoal	1680 ± 50	-23.4	Pta-3312
	3b	X-RAY	I	charcoal	1780 ± 50	-23.9	Pta-5615ϕ
	3b	VALIANT	T	charcoal	1800 ± 60	-23.7	Pta-5616ϕ
	5a	UM2	AA2/II	marine shell	3160 ± 60	+0.2	Pta-5498ϕ
	5c	REBEL	S3/III	marine shell	* 3410 ± 60	0.0	Pta-5662ϕ
	6	SM2	AA2	charcoal	3520 ± 60	-21.1	Pta-3604
	8	FU3	AA2	charcoal	4020 ± 60	-23.5	Pta-3608
	10	MELANIE	S1/II	charcoal	4190 ± 60	-23.3	Pta-3608
	10	human burial	R1	collagen	4050 ± 100	-15.4	Oxa-477
	13a	DELTA	S1	charcoal	4330 ± 50	-23.9	Pta-3605
	13b	ECHO	S1/III	marine shell	* 6910 ± 80	-0.5	Pta-5479ϕ
	14	GANDALF	S1/I	estuarine shell	* 5530 ± 30	-1.2	Pta-5981ϕ
	14	HOME	S1/I	marine shell	7700 ± 70	+1.2	Pta-3596
PANCHO'S KITCHEN MIDDEN	1	LATINA	N7	charcoal	570 ± 20	-24.2	Pta-5605ϕ
	2	MISTERIO	K5	charcoal	880 ± 50	-23.8	Pta-5921ϕ
	3	TEMPRANO	N7	charcoal	2640 ± 60	-23.0	Pta-5602ϕ
	4	SH.GRINGO	N7	charcoal	2940 ± 20	-23.7	Pta-5990ϕ
	6	PENCO	N7	charcoal	3060 ± 60	-24.2	Pta-5923ϕ
	7	SH.PANCHO II	L7	charcoal	3570 ± 60	-24.1	Pta-5743ϕ
SPRING CAVE	2	ASH IV	D9/I	charcoal	460 ± 40	-18.3	Pta-4062
	3	DBM	D9/II	charcoal	840 ± 50	-16.6	Pta-4042
	4	ECHO	I9	charcoal	1150 ± 50	-19.4	Pta-4035
	5	UDF	I9	charcoal	2970 ± 60	-21.5	Pta-4033
	6	BM	I9	charcoal	3510 ± 60	-19.3	Pta-4027

Table 4.1 (continued)

SITE	LAYER	UNIT	SQUARE	MATERIAL	DATE (BP)	$\delta^{13}C$ ‰	SAMPLE NUMBER
ELAND'S BAY CAVE	2	NKOM	A8	charcoal	320 ± 50	-21.8	Pta-1815
	3b	MRSB	Y7	charcoal	500 ± 45	-20.1	Pta-5813
	4a	EDDI	G7	charcoal	1040 ± 50	-25.7	Pta-5822
	4b	BRST	C8	charcoal	1280 ± 50	-23.2	Pta-5819
	4c	JECH	F7	charcoal	1310 ± 40	-24.0	Pta-5595
	5a	GADD	B9	charcoal	1680 ± 40	-21.1	Pta-5815
	5b	LARM	E9	charcoal	2190 ± 25	-25.5	Pta-5810
	6	LBED	D5	charcoal	3510 ± 45	-20.9	Pta-0687
	7	RETS	Y8	charcoal	3290 ± 60	-22.0	Pta-5811
	7	RADS	Y7	charcoal	4160 ± 60	-23.6	Pta-5805
	8a	JOFR	C9	charcoal	3780 ± 60	-22.2	Pta-5806
	8b	SOYI	Z8	Zostera grass	3780 ± 85	-18.1	Pta-1816
	9	BARH	Y4	charcoal	3940 ± 60	-19.0	Pta-5317
	9	SHAK	B4	charcoal	4370 ± 60	-22.7	Pta-5313
ELAND'S BAY OPEN		SPIT 1	E	charcoal	590 ± 50	-23.8	Pta-2460
		BM	A	charcoal	705 ± 45	-21.1	Pta-2465
		EVEN	J	charcoal	1470 ± 50	-22.3	Pta-2469
		SPECKLE	J	charcoal	2920 ± 60	-22.7	Pta-6265ϕ
BORROW PIT MIDDEN		lens	test excav.	charcoal	640 ± 50	-23.4	Pta-4023
HAIL STORM MIDDEN	1	surface	small excav.	charcoal	990 ± 60	-21.7	Pta-4018
	4	GBS/PS	small excav.	charcoal	910 ± 40	-21.9	Pta-4262
CONNIE'S LIMPET BAR 1		lens	small excav.	charcoal	390 ± 40	-22.4	Pta-4020
EAGLE CAVE		surface	sounding	charcoal	2910 ± 60	-21.5	Pta-5920ϕ
NUWEDAM A		surface		marine shell	990 ± 50	-0.1	Pta-4478

Table 4.1 (continued)

SITE	LAYER	UNIT	SQUARE	MATERIAL	DATE (BP)	$\delta^{13}C$ $^{o}/oo$	SAMPLE NUMBER
SCORPION SHELTER		DSS5	L6/II	charcoal	450 ± 35	-24.4	Pta-6340
		DSS8	L6/II	charcoal	1040 ± 50	-24.3	Pta-6480
		DSS14	L6/II	marine shell	3430 ± 20	-0.2	Pta-6341
DUNE FIELD MIDDEN (North) #		KIR	072	charcoal	600 ± 40	-24.1	Pta-5277
		KIR	026	charcoal	710 ± 45	-18.6	Pta-4799
DUNE FIELD MIDDEN (South) #		FRA	030	charcoal	580 ± 50	-23.5	Pta-5061
		FRA	026	marine shell	1240 ± 40	+0.03	Pta-5031
CAPE DESEADA MIDDEN		shell lens 2	test pit 1	marine shell	2450 ± 50	+0.4	Pta-5918ϕ
		shell lens 2	test pit 2	marine shell	2500 ± 50	-0.3	Pta-5919ϕ
RAILWAY MIDDEN		lens	test pit 1	marine shell	2450 ± 50	+0.3	Pta-5917ϕ
		lens	test pit 2	marine shell	2400 ± 40	+0.4	Pta-5916ϕ
MIKE TAYLOR'S MIDDEN		CAN	test pit E1	marine shell	2270 ± 25	-0.3	Pta-7013ϕ
		spit 2	test pit E3	charcoal	2130 ± 50	-22.2	Pta-3641
		spit 10	test pit E3	charcoal	2460 ± 50	-23.5	Pta-3207
		spit 3	test pit E4	charcoal	1780 ± 60	-21.1	Pta-3640
		spit 7	test pit E4	charcoal	2090 ± 50	-20.4	Pta-3659
		spit 12	test pit E5	charcoal	2820 ± 50	-21.0	Pta-3720
	BSS	BSS1	test pit E9	marine shell	985 ± 25	+1.3	Pta-6711ϕ
	PSS	PSS3	test pit E9	marine shell	1735 ± 30	+0.5	Pta-6698ϕ
	FS	FS1	test pit E9	marine shell	2000 ± 25	-0.1	Pta-6690ϕ
	FS	FS3	test pit E9	marine shell	2070 ± 25	+0.3	Pta-6705ϕ
	FS	FS6b	test pit E9	marine shell	2160 ± 50	+0.3	Pta-6707ϕ
	WS	WS3	test pit E9	marine shell	2100 ± 30	+0.3	Pta-6683ϕ
		BARN3	test pit E9	marine shell	2220 ± 60	+0.7	Pta-6694ϕ
		DGM	test pit E9	marine shell	2340 ± 60	+0.5	Pta-6693ϕ

= these dates are taken as representative of a number of radiocarbon dates obtained for the site of Dune Field Midden (Parkington *et al.* 1992)

Table 4.1 (continued)

SITE	LAYER	UNIT	SQUARE	MATERIAL	DATE (BP)	$\delta^{13}C$ $^{0}/_{oo}$	SAMPLE NUMBER
PUBLIC RESORT 1		(b. of m.)	sounding	charcoal	2570 ± 60	-23.8	Pta-4022
		(b. of m.)	sounding	marine shell	2610 ± 50	0.3	Pta-4030
LANGDAM 9		lens on dune		marine shell	2150 ± 20	-0.6	Pta-6274ϕ
SOUTKLOOF 1		(b. of s.)	sounding	marine shell	3080 ± 60	+0.4	Pta-5986ϕ
SOUTKLOOF 3b		surface	12	marine shell	2380 ± 45	+0.6	Pta-5437ϕ
SOUTKLOOF 5b		surface	18	charcoal	2100 ± 45	-15.5	Pta-5384ϕ
STEENBOKFONTEIN	1 (t)	TWIG	K4	charcoal	2200 ± 60	-20.7	Pta-6136ϕ
	1 (b)	HbAST	K3	charcoal	2200 ± 50	-22.5	Pta-6424ϕ
	2	HAWK 2+3	K3	microfauna	2360 ± 45	-19.9	Pta-6498ϕ
	3 (t)	KESTREL 2	K4	twigs	2490 ± 50	-20.7	Pta-6505ϕ
	3 (b)	ORACLE	K4	charcoal	2690 ± 60	-23.0	Pta-6134ϕ
	4a (t)	GRFU	J3	marine shell	3510 ± 50	-1.9	Pta-6794ϕ
	4a (b)	LFSO	J3	marine shell	3640 ± 60	-1.0	Pta-6805ϕ
	4b (t)	SHAMAN	K3	charcoal	3990 ± 60	-20.9	Pta-6420ϕ
	4b (b)	O.MANTIS	K3	charcoal	6070 ± 80	-21.0	Pta-6808ϕ
DOORSPRING 16	3	SSWS2	M8	marine shell	4090 ± 35	+0.1	Pta-6742
	4	DPSSWS6/7	M8	marine shell	5130 ± 50	+0.1	Pta-6740
LAMBERT'S BAY DUMP		(b. of s)	sounding	marine shell	2770 ± 60	+1.9	Pta-3201
MALKOPPAN		M. MUSSEL	test pit	charcoal	2460 ± 50	-22.1	Pta-6219ϕ
		PGLR	test pit	charcoal	4230 ± 60	-21.9	Pta-6220ϕ
GROOTRIF B		sample A	test pit	charcoal	2190 ± 60	-20.6	Pta-4081
		sample B	test pit	charcoal	2320 ± 70	-20.2	Pta-4098
		sample D	test pit	marine shell	2620 ± 50	+0.5	Pta-4067
		sample E	test pit	charcoal	2700 ± 60	-22.1	Pta-4068

(b. of m.) = bottom of midden; (b. of s.) = bottom of single lens; (t) = top; (b) = bottom

Table 4.1 (continued)

SITE	LAYER	UNIT	SQUARE	MATERIAL	DATE (BP)	$\delta^{13}C$ °/oo	SAMPLE NUMBER
GROOTRIF D		unit 1	test pit	charcoal	2290 ± 50	-22.0	Pta-4075
		unit 4	test pit	charcoal	2470 ± 60	-22.0	Pta-4085
		unit 8	test pit	charcoal	2540 ± 50	-23.4	Pta-4083
		unit 14	test pit	charcoal	2680 ± 60	-25.0	Pta-4060
		unit 18	test pit	charcoal	2830 ± 60	-20.1	Pta-6221j
		unit 20	test pit	shell	3030 ± 20	+0.1	Pta-6216j
GROOTRIF G		sample I	test pit	charcoal	690 ± 40	-19.0	Pta-4070
		sample III	test pit	charcoal	2380 ± 60	-19.0	Pta-4055
KREEFBAAI C		sample A	test pit	charcoal	2470 ± 60	-19.6	Pta-3313
		sample B	test pit	charcoal	2490 ± 60	-21.5	Pta-3589
		sample E	test pit	charcoal	2460 ± 60	-20.9	Pta-4047
		sample G	test pit	charcoal	2550 ± 50	-20.7	Pta-4046
		sample I	test pit	charcoal	3190 ± 60	-22.2	Pta-4045

(b. of s.) = bottom of single lens

Table 4.2: Volume observations (numbers of buckets and approximate number of m^3) of excavated/sampled deposit from Tortoise Cave (TC), Pancho's Kitchen Midden (PKM), Steenbokfontein Cave (SBF), and several megamiddens (Fig. 4.12). (*: 65 bkts = 1 m^3)

SITE	LAYER/UNIT	BKTS*	m^3
TC	1a	124.9	1.9
	1b	38.3	0.6
	2a	76.1	1.2
	2b	95.8	1.5
	3a	104.5	1.6
	3b	105.1	1.6
	5	55.2	0.8
	6	62.3	0.9
	7	51.7	0.8
	8	30.3	0.5
	10	59.9	0.9
	11	75.2	1.1
	13a	71.0	1.1
PKM	1	39.2	0.6
	2	23.7	0.4
	3	35.8	0.5
	4	53.8	0.8
	5	28.6	0.4
	6	30.6	0.5
	7	51.7	0.8
SBF	1	45.2	0.7
	2	36.1	0.5
	3	112.5	1.7
	4a	21.6	0.3
	4b	39.0	0.6
MKP	T MUSSEL	8.6	0.13
	M MUSSEL	7.0	0.10
	B MUSSEL	2.0	0.03
	B.B. MUSSEL	4.0	0.06
	SANDY P.	15.0	0.23
	PGLR	21.4	0.32
GFD	1	3.7	0.05
	2	5.0	0.07
	3	2.0	0.03
	4	3.1	0.05
	5	1.4	0.02
	6	2.0	0.03
	7	1.6	0.02
	8	5.6	0.08
	9	2.0	0.03
	10	2.0	0.03
	11	2.1	0.03
	12	1.0	0.01
	13	3.8	0.05
	14	2.5	0.04
	15	2.1	0.03
	16	1.6	0.02
	17	5.5	0.08
	18	8.0	0.12

Table 4.2 (continued)

CDM			
(test pit #1)	top lens	2.0	0.03
	bottom lens	2.0	0.03
(test pit #2)	top lens	3.0	0.04
	bottom lens	4.0	0.06
RWM			
(test pit #1)	shell lens	1.0	0.01
(test pit #2)	shell lens	1.0	0.01
MTM	LS	1.6	0.02
	BSS	18.2	0.28
	PSS	19.7	0.30
	FS	46.0	0.71
	WS	8.2	0.12
	GFS	5.1	0.08
	BARN1	2.9	0.04
	GFS2	1.7	0.02
	BARN2	4.7	0.07
	GFS3	1.4	0.02
	BARN3	5.5	0.08
	DGM	3.0	0.04

THE EXCAVATIONS AT TORTOISE CAVE:

Tortoise Cave is a small, east facing rock shelter situated some 500 m south of the Verlorenvlei at an altitude of 60 m above present sea level (32°19'37" S, 18°21'37" E) (Fig. 4.1). The shelter is formed at the interface of conglomerate and a layer of smooth orthoquartzitic sandstone (Robey 1987), which together form the TMS (see Chapter 3). The cave is 5 m across and 7 m wide at the entrance, with a maximum hight of 1.65 m from bed-rock to the ceiling (Fig. 4.3). Initial excavations were carried out by John Parkington during 1978, and subsequent excavations were completed by T. Robey between 1980 and 1983. A total of 33 m^2 were excavated to bed-rock, and a further 8 m^2 were partially excavated. The broad subdivisions of the Tortoise Cave sequence into "cave", "talus" and "outer cave" deposits, as suggested by Robey (1984, 1987) are mantained here. These spatially and chronologically distinct phases are referred to as the three main episodes of occupation during the late-Holocene.

The earliest occupation of this site took place just after 8000 years BP (Table 4.1). It is comprised of three types of deposits, namely: pre-occupation aeolian sand, containing cultural remains from the units lying above; shell and ash lenses with an admixture of humus and grit; as well as cemented ash and shell patches interpreted as hearth markers (Robey 1984). These deposits are no more than 30 cm deep. This apparently short episode is stratigraphically defined by Layers 14 and 13b, both located in the outer portion of the cave (Fig. 4.3). A hiatus, represented in sites of the whole Eland's Bay area (Chapter 1) and of at least 2500 year duration, followed the deposition of Layer 13b.

A date of 5530 ± 30 BP (Table 4.1) recently obtained for Layer 14 has been regarded as anomalous and likely to be the result of admixture. The reasons for this are twofold. First, the 5530 ± 30 BP date is inverted when compared to the date from Layer 13b above and inconsistent with the other date from Layer 14 (Table 4.1). Second, the stone tool assemblage from Layers 13b and 14 resembles the one above dating to *c.* 4000 BP (Robey 1987). On the other hand, the corrected date of 6910 ± 80 BP for Layer 13b might also be considered as partly mixed on the basis of the stone tool assemblage composition, although it is not entirely impossible that some mid-Holocene material is present in these deposits. No other reliable mid-Holocene occupation has previously been observed for the west coast and only a few in the Karoo region (J. Deacon 1974; Parkington *et al.* 1988). This apparent time gap in radiocarbon dated deposits of the study

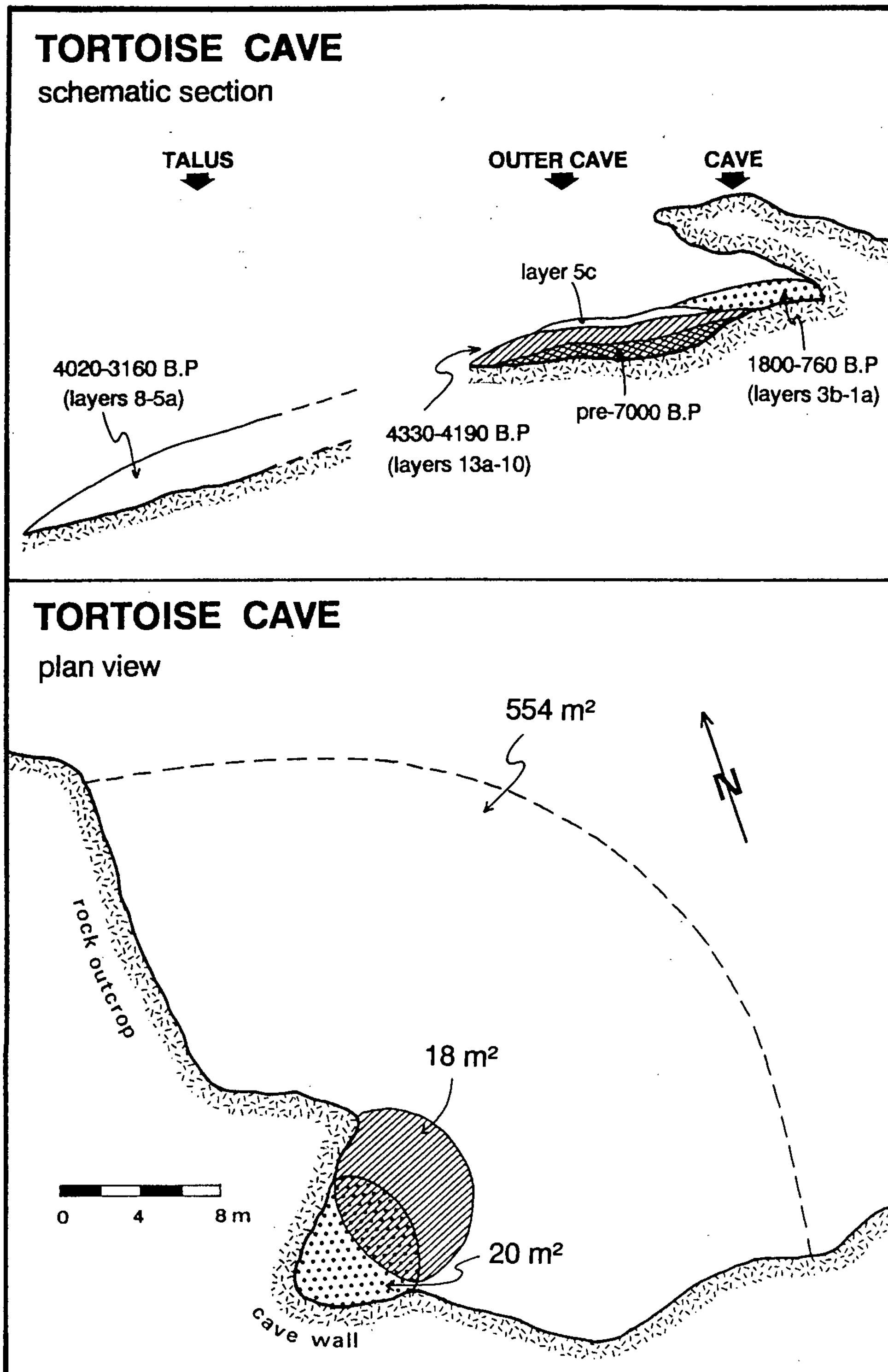

Figure 4.3: Schematic section and plan view of Tortoise Cave.

area, however, might prove not to be absolute, as new and reliable dates of mid-Holocene age have been obtained recently (see below).

Taking into account the chronological discontinuity between the early and late-Holocene deposits at Tortoise Cave, and the fact that this thesis is mainly concerned with the last 4300 years of coastal archaeology in the research area, the material resulting from the initial occupation dating to 6900 to 7700 BP has not been included in the present analysis.

The first post-hiatus occupation took place in the outer cave area (Fig. 4.3), and is dated to between 4330 and 4190 BP (Table 4.1). This episode is defined stratigraphically by Layers 13a to 10, which together consist of approximately 40 cm of archaeological material. Layer 13a is soily and browner than Layer 14 and 13b, and also more gritty in texture when compared to Layer 11 (Robey 1984). Layer 11 is defined by shell lenses around the drip line, becoming greyer and very ashy towards the inside of the cave. Layer 10 is a series of substantial, ashy shell middens in primary context, cut by a burial pit in square R1, dated on human bone to 4050 ± 100 BP (Table 4.1). The deposits originally defined by Robey (1984) as Layer 9 were considered by him to be part of this first episode of occupation. For reasons stemming from the subsequent revision of Tortoise Cave stratigraphy, however, these deposits are no longer included as part of this episode (see below). Table 4.2 lists the number of buckets excavated from each layer accumulated during the first episode of occupation.

The second episode of occupation is characterised by thick (1.0 to 1.3 m deep) and dense shell midden deposits which date from 4020 to 3160 BP (Table 4.1) and are located on the talus slope outside the cave (Fig. 4.3). These deposits include Layers 5 to 8, and by far the greatest proportion of the archaeological material at Tortoise Cave consists of these poorly stratified talus deposits. Two squares (AA and AA2) were excavated. Robey (1987) regarded these deposits as largely in secondary context, although a few *in situ* ash and shell lenses were recorded from Layers 6 and 5 (Robey 1984).

A new date of 3410 ± 60 (Table 4.1) from a unit within the original Layer 9 (Robey 1984, 1987), suggested that this occupation was contemporary with the cave talus. As a result of this, Robey's Layer 9 was renamed as Layer 5c (Jerardino 1993). However, after the complete reanalysis of the contents of these deposits, it became apparent that the stratigraphic integrity of these shell middens are likely to be compromised by mixture with older deposits, and that this has affected the dating results. Given the fact that Robey (1984) noted that Layer 9 was almost certainly in secondary context, and that it forms the surface, this conclusion is justified.

Consequently, for the purpose of this thesis, Layer 5c (or former Layer 9) will not be discussed. The number of buckets excavated from Layers 8 to 5a are shown in Table 4.2.

After a second, 1300-year-long hiatus, during which settlement shifted to the megamiddens (Chapter 1), the cave was revisited between 1800 and 760 BP (Table 4.1). The archaeological remains of this third and last episode of occupation are found only within the cave and are stratigraphically defined by Layers 3b to 1a (Fig. 4.3). Most of these deposits were generated between 1800 and 1600 BP, as inferred from the dates of Layers 3b to 2a (Table 4.1) and also by the fact that the 760 BP date came from surficial bedding deposits. These layers are characterized by a series of well-stratified soily shell middens around the back and sides of the shelter, with loose hearths and ash lenses in the central area. Some evidence of burrowing and termite disturbance was found in both of these deposits. Bedding was preserved in Layers 1a to 2b. Table 4.2 shows the volumes of deposit excavated from Layers 3b to 1a.

Brief discussion on Tortoise Cave excavations

Robey (1984, 1987) determined that the deposits dating to the last 2000 years rested in a prehistorically excavated hollow or basin that had been dug out from older material, presumably to increase the space inside the small cave. Evidence of subsequent and partial clearance of deposits, (between Layers 2 and 3) was also observed by Robey (1987). These observations suggest that this cave has experienced prehistoric excavation, not only once, but several times, throughout its occupational history. It seems that the cave was periodically emptied, and the removed material dumped on the outer cave and talus slope. However, Robey himself recognized that the whole of the talus deposits probably did not originate only as a result of this process (Robey 1987). The presence of features in the excavated squares of the talus, as well as the immense volumes of the talus deposits extending over a fairly wide area, seem to suggest that a substantial part of the these deposits were generated from activity outside the cave. Likewise, most of the deposits dating to the first episode of occupation and located just outside the cave also appear to be in primary context and were only partially affected by dispersion and slumping (Robey 1984).

THE EXCAVATIONS AT PANCHO'S KITCHEN MIDDEN:

Pancho's Kitchen Midden is a small rocky overhang with a large talus situated at an altitude of 35 m above present sea level in the surroundings of Waterkloof (32°20'22" S, 18°20'

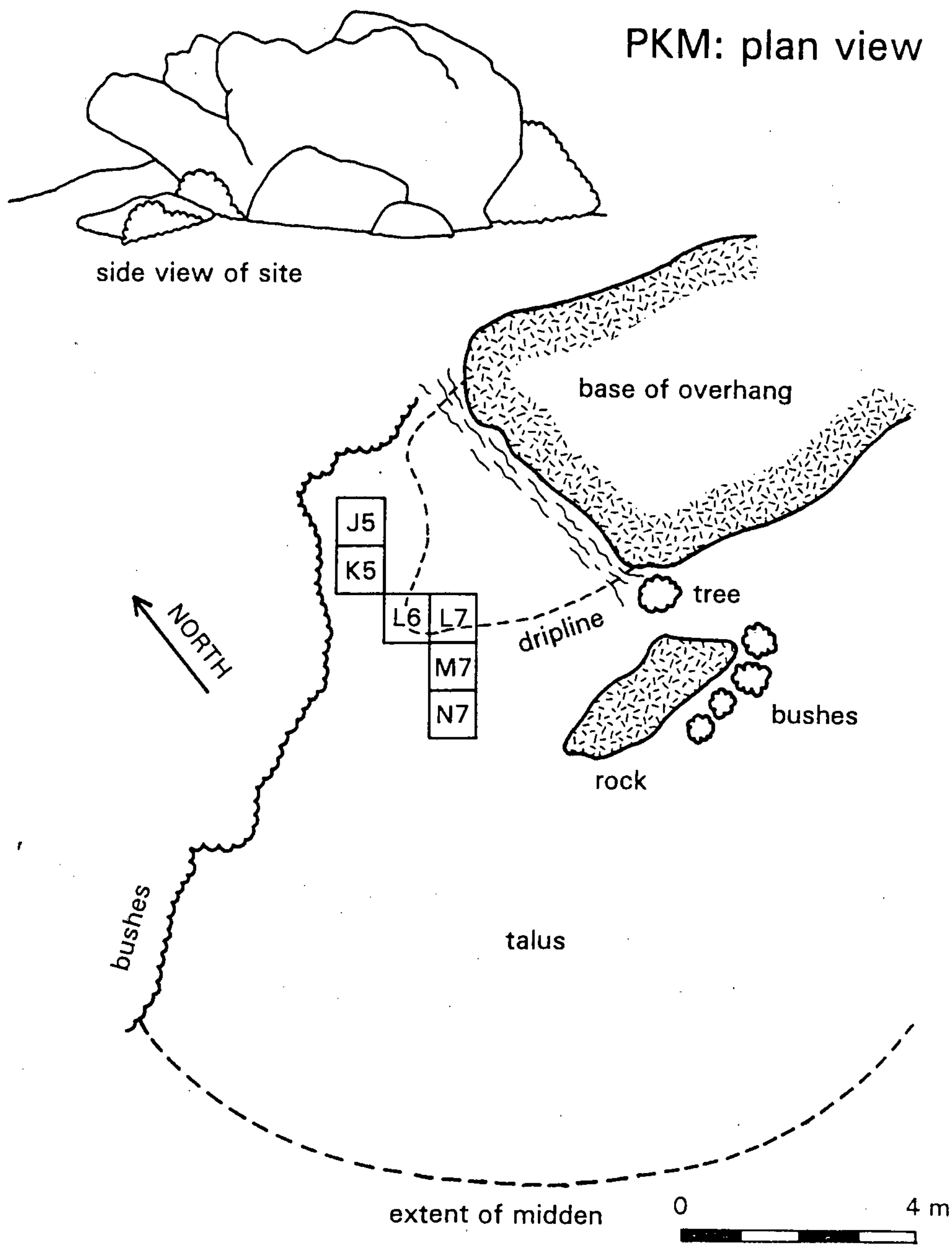

Figure 4.4: Site plan of Pancho's Kitchen Midden showing the location of excavated squares.

E) (Fig. 4.1). The shelter is oriented south-west and, being very small, must have offered only marginal protection from the south wind which is prevalent during summer. Nevertheless, by virtue of its location on the south-facing foothill of Waterkloof, this site offers excellent protection from the dominant north-west winds during the cold winter months.

The overhang has a roughly triangular shape, and is constituted by a TMS boulder detached from the contiguous rocky outcrop. The base of the shelter is 5.5 m across, with a dripline at a distance of 4 to 2 m from it (Fig. 4.4). The ceiling of the shelter is 2.5 m high at its highest point, from where it dips straight down towards its base. A drainage channel, which is presently active during rainy weather, can be observed next to this base (Fig. 4.4). Excavations were conducted for the purposes of this thesis project between 1990 and 1992. Three 1 m^2 were excavated to bedrock and another three 1 x m^2 were opened to a depth of 20 to 30 cm (Fig. 4.4). The excavated material was sieved through a 3.3 mm mesh. Besides fauna and artefacts routinely recovered from excavations all pieces of charcoal present in the deposits were collected, and bulk samples for shellfish analysis were also taken.

Stratigraphically, Pancho's Kitchen Midden is a superimposed series of relatively dense shell middens separated by sandier partings (Fig. 4.5). Shell dominates all other components overwhelmingly. Seven stratigraphic layers were observed, and six radiocarbon dates have so far been obtained for this sequence (Table 4.1, Fig. 4.5). The basal occupation of Pancho's Kitchen Midden dates to 3570 ± 60 BP (Layer 7) and is characterized by two shell lenses in a 15 cm thick light brown sand and gravel matrix (Fig. 4.5). Faunal remains in this layer are relatively frequent. Subsequent visits to the site have been dated to 3060 ± 60 BP and stratigraphically defined as Layer 6. This layer is characterised by a 10 cm thick, grey lens of dense shell. Immediately above this layer, there are substantially sandier, light brown deposits with minor shell lenses. These deposits comprise Layer 5, which remains undated (Fig. 4.5). A date of 2940 ± 20 BP was obtained from the next occupation layer. These deposits (Layer 4) are characterized by a distinctive 15 to 20 cm thick and very dark, dense layer of shell. The subsequent and last pre-pottery period occupation at the site (Layer 3) is represented by a moderately dense layer of highly fragmented shell in a relatively poor state of preservation. The matrix is sandy and dark-brown in colour. This layer was dated to 2640 ± 60 BP (Fig. 4.5). Faunal remains were relatively inconspicuous between Layers 6 and 3. After an apparently 1500 year long hiatus, Pancho's Kitchen Midden was visited once again during the last 1000 years. Layers 1 and 2 date to 570 ± 20 BP and 880 ± 50 BP respectively (Table 4.1), and are represented by 10 to 15 cm and

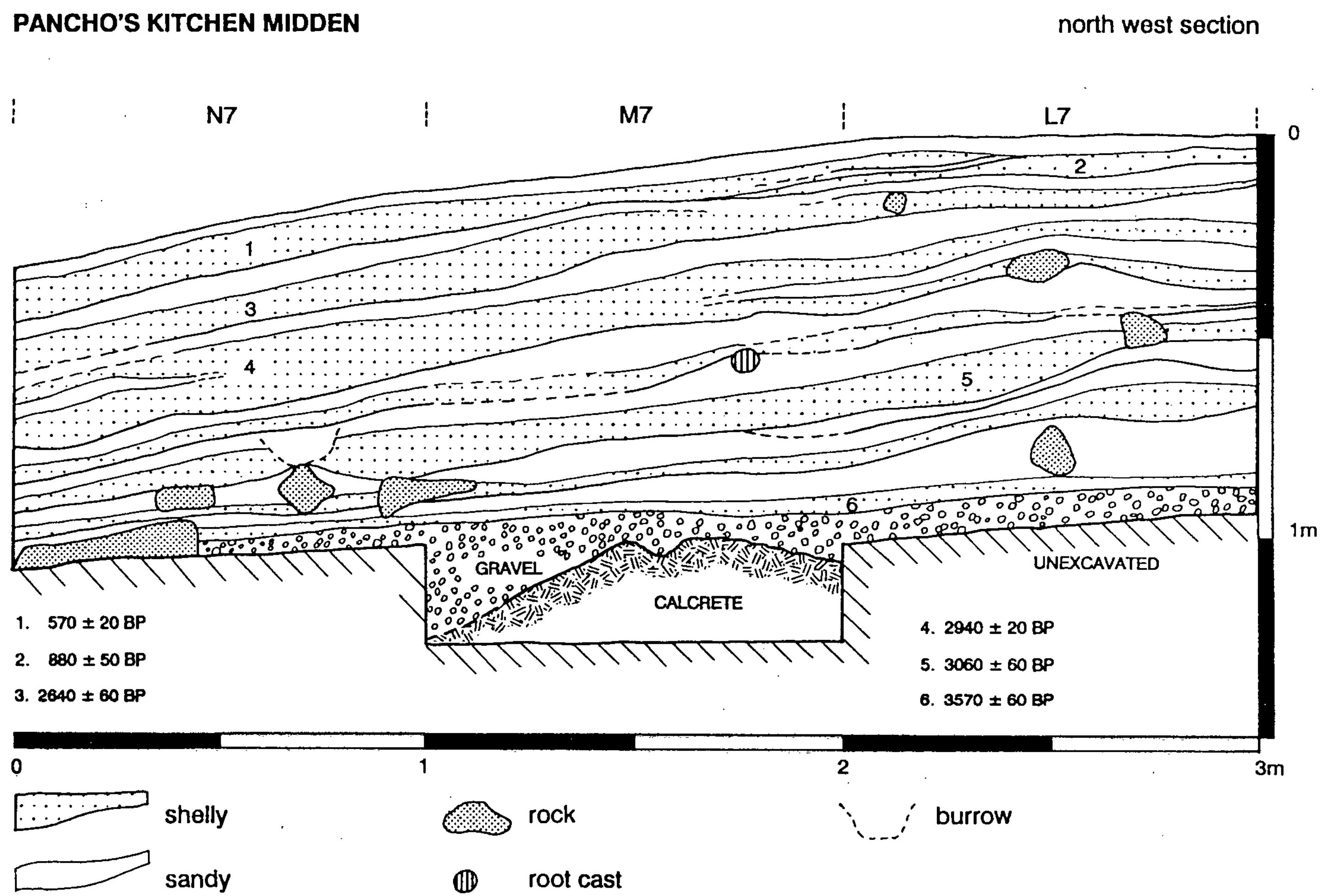

Figure 4.5: West facing section of squares N7, M7 and L7 at Pancho's Kitchen Midden.

5 to 10 cm thick subsurface deposits of sand and dense shell (Fig. 4.5). Fauna was encountered more frequently in Layer 1 than in any of the older deposits. Table 4.2 shows the volumes of deposit excavated from Pancho's Kitchen Midden.

Brief discussion on Pancho's Kitchen Midden excavations

According to the dates obtained from Pancho's Kitchen Midden, this site is the first recorded rock shelter on the west coast with a not insubstantial volume of deposit dating to the megamidden period. This finding certainly presents the first exception to the settlement pattern derived from previous observations (Parkington *et al.* 1988) in the Eland's Bay area.

Close scrutiny of section drawings, and observations during excavations yield no evidence for clearly defined hearths or any other site feature (e.g. basins and bedding patches) in the excavated squares of Pancho's Kitchen Midden. It is possible that such features might be encountered in the sheltered area located directly below the overhang, where domestic activities related to the preparation of food might have taken place. It is possible that the thin ashy and soily lens (FOGON) encountered in L7 might constitute the edge of a larger ash body originating from a hearth lying mainly below the overhang. Further excavations at this site should not only include additional squares on the talus slope, but should also involve the excavation of at least a few squares within the shelter. Such objectives are important prerequisites for the proper understanding of the site structure in Pancho's Kitchen Midden. It is also important to note that possible edges of any feature found close to the base of the overhang might be difficult to define because water periodicaly washed down from the slopes of the nearby outcrop.

Whatever the findings within the sheltered area that might emerge as a result of future research, it is already clear that the talus of Pancho's Kitchen Midden lies mostly in primary context. The area within the shelter is very confined, and because of this, it is quite inconceivable that people did not use a wider area for the whole range of activities involved during each visit. The fact that at least 90% of Pancho's Kitchen Midden deposits are found on the talus seem to support this scenario. Field observations on sections from squares N7, M7 and L7 show no evidence of small shell heaps that could have accumulated as a result of periodical cleanings of the area contained within the shelter. It is possible that the small sheltered area was mainly used for small fires and/or as a sleeping area, and the surrounding space for the majority of activities.

Evidence for recent disturbance by dune mole rats were observed most frequently around the periphery of the site during each visit to Pancho's Kitchen Midden. Animal burrowing was also observed in the excavated area, most of which were confined to Layers 1 and 2, particularly in squares J5, K5 and L6. Fortunately, most of these disturbances were detected and isolated during excavations.

THE EXCAVATIONS AT STEENBOKFONTEIN CAVE:

Steenbokfontein Cave is located 6 km north of Wadrifsoutpan, in a prominent sandstone outcrop or "koppie" (32°09'42" S, 18°20' E), surrounded by a relatively flat terrain and low undulating sand dunes. The cave is oriented west north-west and overlooks nearby reefs and beaches 1.8 km distant (Fig. 4.2). With dimensions of 19 m long, 9 m deep and a 7 m high domed ceiling lowering towards the rear wall, the cave is large and consequently offers excellent protection from the elements, especially from strong southeasterly winds in the summer months. Several rock paintings are found in Steenbokfontein Cave, most of which consist of hand prints and human figures but include at least two images of fat tailed sheep.

Another, yet unstudied, large cave facing SSE is located in the same outcrop and contains the largest volume of archaeological cave deposits present on the entire west coast. Some thirty metres from the entrance of this large cave is yet another, very much smaller shelter with deposit and hand prints. Judging by the cumulative volumes of archaeological residues in these sites and the prominence of the koppie in the surrounding landscape, it is clear that the area was a major focus of coastal hunter-gatherer settlement in the past.

During the three field seasons at Steenbokfontein Cave, five m^2 were dug to different depths in an area next to the rear wall of the cave and below a high set ledge (Fig. 4.6). The excavated material was sieved through a 3.3 mm mesh stacked on top of a 1.5 mm mesh. As in the case of Pancho's Kitchen Midden, besides the usual items routinely recovered, all pieces of charcoal present in the deposits were collected and shellfish bulk samples were also taken. All material retained by the 1.5 mm mesh was kept for further analyses. Table 4.2 shows the volumes of deposit excavated from each main stratigraphic layer at Steenbokfontein Cave.

The stratigraphy at this site is very complex. Four of the five major stratigraphic layers lie within basins formed by the removal of older deposits. The morphology of the deposits was also greatly complicated by the fact that one of the basins was cut into the previous one, thus removing a considerable volume of deposits below it. As revealed by the excavation, the

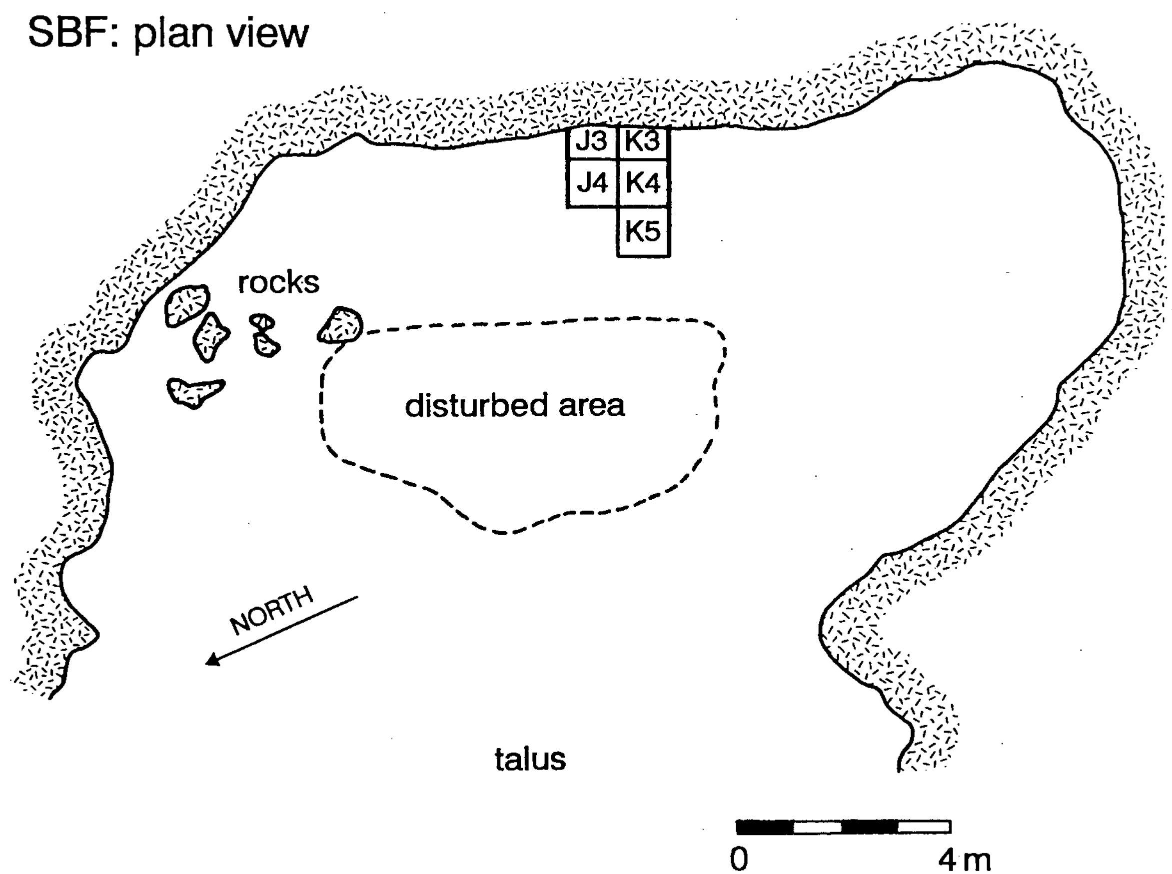

Figure 4.6: Site plan of Steenbokfontein Cave showing the location of excavated squares.

infilling deposits of the older basin (found only in squares J3 and J4) lie at a moderate angle, apparently dipping down towards the south end of the cave. In contrast, the deposits present in the second and younger basin lie at a very steep dip towards the back wall of the shelter (Fig. 4.7). Infill material from this basin was recovered from all excavated squares (Fig. 4.8). The deposits truncated by the excavation of both basins during prehistoric times lie at an angle, dipping down towards the northern end of the cave (Fig. 4.9). To further complicate the stratigraphy in Steenbokfontein Cave it is also apparent that the original pile formed by the younger basin infill deposits (and possibly those from the older one) suffered massive removal of material sometime in the past 2000 years. This is evidenced by a truncation of all the steeply dipping basin infill units which form the present day surface of the shelter deposits in the vicinity of the excavation (Fig. 4.8).

Layers 1 to 3 all form the filling of the basin cut into the deposits formed by a previously infilled basin (Layer 4a), and also into earlier material (Layer 4b). Details of the stratigraphy in Steenbokfontein Cave are as follows (Figs. 4.8, 4.9).

Layer 1: This layer is mostly comprised by loosely compacted, light grey brown, extremely sandy deposits with slightly fragmented shell. There are numerous macrobotanical remains, predominantly twigs of various sizes. Large desiccated fragments of kelp (*Ecklonia maxima*) are also conspicuous. As a consequence of the surface truncation and the depositional dip this stratigraphic layer increases in depth towards the rear wall of the cave (Fig. 4.8). Charcoal from one of the topmost and one of the lowermost units within this layer dates to 2200 ± 60 BP and 2200 ± 50 BP (Table 4.1) respectively. This layer was present in squares K3, K4, J3 and J4 (Fig. 4.6).

Layer 2: These deposits consist of lightly compacted, pale brown organic sands with thin lenses of shell. Botanical remains are represented predominantly by small twigs. Extremely well preserved microfaunal remains are present in great numbers. This stratigraphic layer thins out slightly towards the rear wall of the cave (Fig. 4.8). A sample of postcranial microfaunal bones yielded a date of 2360 ± 45 BP (Table 4.1). Deposit from this layer was recovered from squares K3, K4, J3, J4 and, marginally, from K5.

Layer 3: This layer is by far the most variable of all the layers so far excavated (Fig. 4.8). Most prominent are heavily burnt, fairly deep, and loosely packed shell midden deposits. Due to the extreme heating the ashy bodies are poorly structured and shell lenses are consequently difficult to trace in the section. Several hearth features were observed, at least one of which

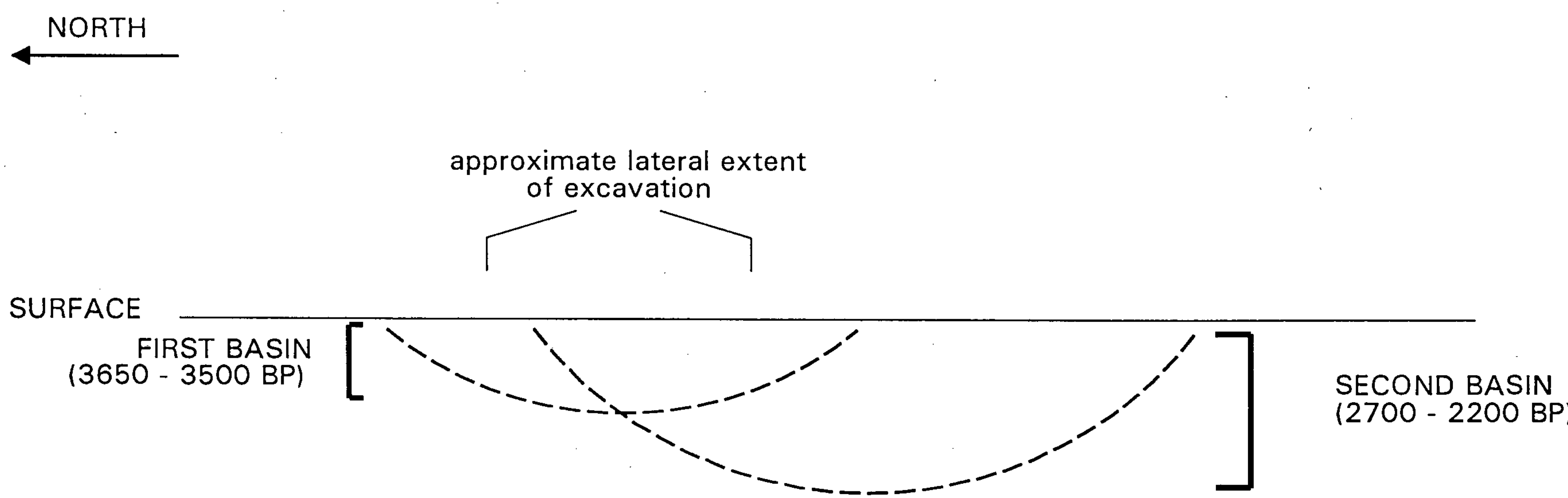

Figure 4.7: Schematic representation of the relationship of the two prehistoric basins at Steenbokfontein Cave.

included large fragments of rocks and grindstones, many of which showed evidence of ochre smearing on their surface (shell and ash lens containing both rocks depicted in Fig. 4.9). Stratigraphically equivalent deposits located towards the entrance of the cave are less burnt but highly consolidated by salt crystallization. A notable facies of this layer found peripheral to the burnt areas consist of a series of light brown matted, botanical and shell rich units with common kelp fragments and mammalian coprolites. These are progressively carbonized where in contact with the burnt shell areas. A burial of a human neonate (S. Pfeiffer pers. comm.) was found in square J4 in a small pit, which had been dug into one of these light brown matted units. A wad of grass covered the burial pit, and the preservation was excellent with some tissue surviving. The date of the infant remains are difficult to ascertain, since the covering wad of grass was found directly below the surface. The burial could have taken place any time after the date of the surrounding material. Two dates bracket the occupation span of Layer 3, 2490 ± 50 BP at the top, and 2690 ± 60 BP at the bottom (Table 4.1). This layer was present in all five excavated squares.

Layer 4a: Its grey to cream colour is due to the intensively burnt, and frequently calcined, material which constitutes the whole layer (Fig. 4.9). The deposits are compacted to different degrees, from consolidated and encrusted to loose sand and ashy bodies. The surface of Layer 4a in particular displayed extreme consolidation. Both shell and bone remains suffered extreme burning, and many times were found totally calcined. Combustion of any plant material must have been nearly total, as no trace of them has been found and even charcoal is scarce. For these reasons, any stratigraphic divisions within this layer are impossible to recognize. Excavation followed the natural stratigraphy whenever possible, and proceeded in arbitrary spits when undifferientiated deposits seemed to acquire considerable depth. As already stated above, this heavily burnt layer slopes down gently towards the south, and probably constitutes the infilling of an earlier basin dug into older deposits (Fig. 4.7). As far as can be inferred from field observations, most of the Layer 4a deposits were removed when the second basin was dug through and below it. The slope of this truncation is very uneven, presenting ragged surfaces, a probable indication that the sediments of this layer were already consolidated before truncation. As a consequence of this removal of material, Layer 4a thins out towards the cave wall in J3, where a rock fall was observed within the top 35 cm. This layer was excavated from squares J3 and J4 (Fig. 4.6). A shell sample obtained from the top of this layer yielded a corrected date of

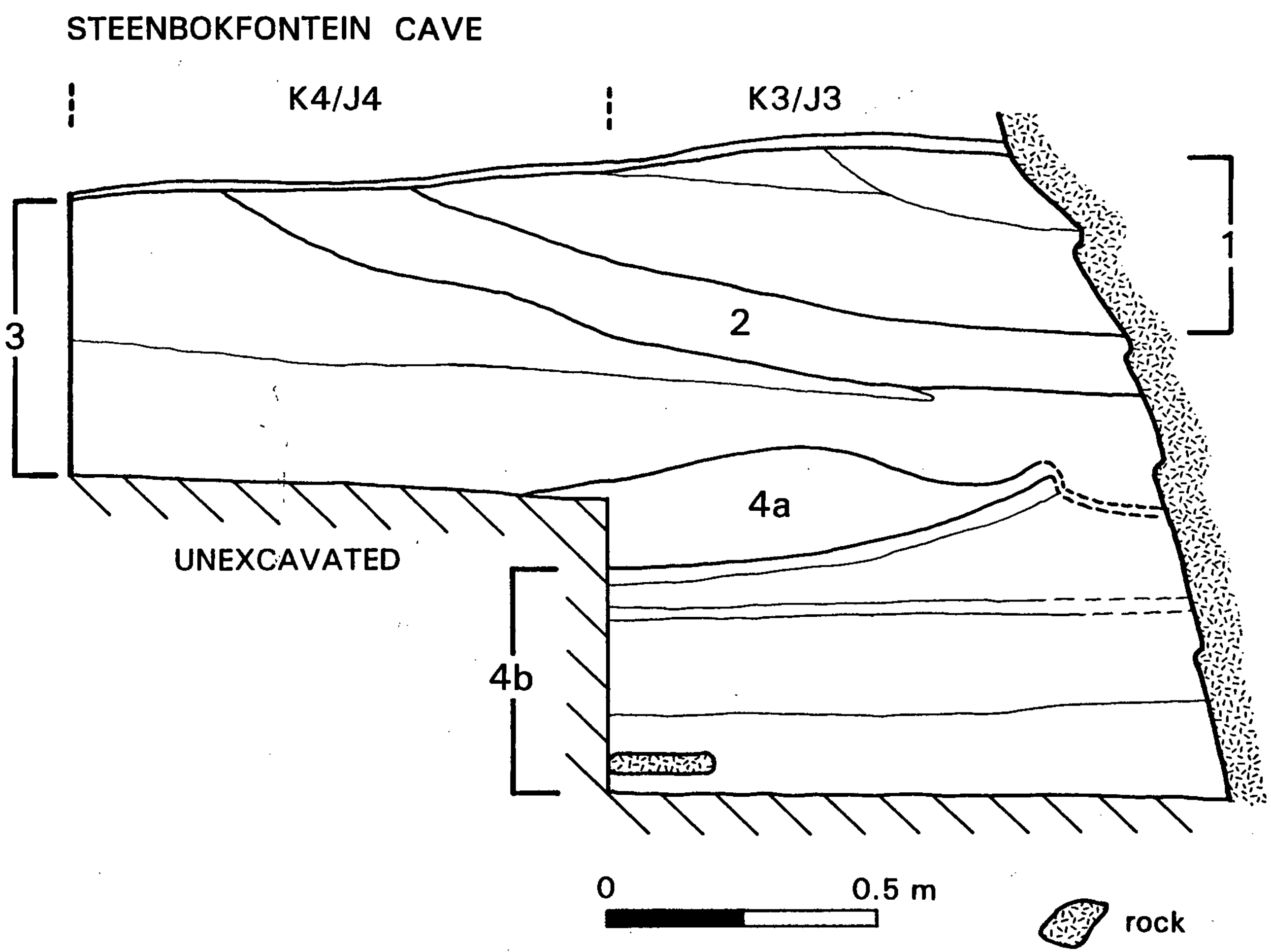

Figure 4.8: Stratigraphy at Steenbokfontein Cave: section drawing from K4/J4 and K3/J3 squares. Note the truncation on the surface of all the steeply dipping basin infill units of Layers 1, 2 and 3.

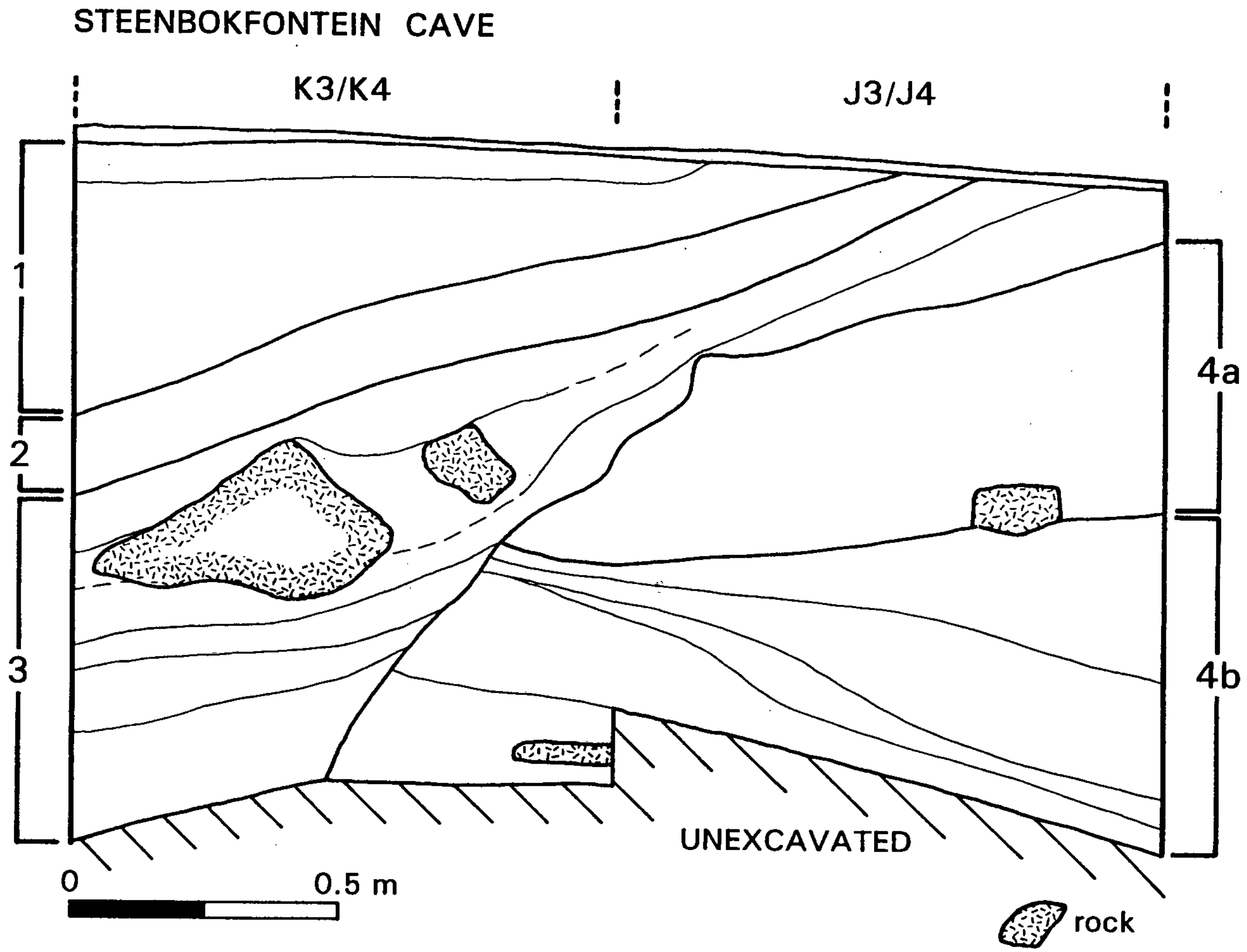

Figure 4.9: Stratigraphy at Steenbokfontein Cave: section drawing from K3/K4 and J3/J4 squares. Note the truncation of Layers 4a and 4b by a basin that was subsequently filled in by Layers 1 to 3.

3510 ± 50 BP. Another shell sample collected from the bottom of this Layer dated to 3640 ± 60 BP (Table 4.1).

Layer 4b: This layer consisted of dark orange brown, highly organic sands with shell lenses. Identifiable botanical matter is present but substantially humified. A charcoal sample from a hearth present a few centimetres from the interface with Layer 4a was dated to 3990 ± 60 BP. Another charcoal date of 6070 ± 80 BP was obtained for one of the bottom most units of Layer 4b (Table 4.1). Layer 4b was excavated from squares K3 and J3, where it was truncated throughout.

Bedrock was not reached during the initial excavations at Steenbokfontein Cave. Considering the volumes of material on the talus of the cave and the geometry of the surrounding bedrock the total depth of deposits at Steenbokfontein Cave can be estimated to be in the order of 5 meters.

Brief discussion of Steenbokfontein Cave excavation

Comparison of the chronological distribution of Steenbokfontein Cave dates with those from other cave sites in the research area reveals that Steenbokfontein Cave is the only known coastal cave on the west coast that was visited more or less regularly between 3000 and 2000 BP. Moreover, the use of the cave during this time period was not insubstantial as a large volume of deposit was generated by the occupants.

The uniqueness of Steenbokfontein Cave in the context of the archaeology of the western Cape is further stressed by the mid-Holocene date of *c.* 6100 BP obtained for Layer 4b. As stated above, no other reliable mid-Holocene occupation had been previously documented for the west coast, with the recent exception of a late mid-Holocene corrected shell date from Doorspring midden dating to 5130 ± 50 BP (J. Kaplan 1994; Fig. 4.2; Table 4.1). It seems very likely that further intensified research in the Lambert's Bay area may reveal a somewhat different Holocene settlement pattern to the one already established for the Eland's Bay area (Parkington *et al.* 1988).

Regarding the stratigraphy at Steenbokfontein Cave, the presence of at least two basins dug next to the rear wall are dominant features. Prehistoric removal of occupational debris had been observed previously in Tortoise Cave (see above), and several basins were also reported from Eland's Bay Cave (Parkington 1977) (Fig. 4.1). The purpose of such removal could have been to increase the habitable area within the cave, or create a sheltered space for domestic activity and/or an expression of a particular set of preferences regarding the spatial organization of the living area. Whatever the initial purpose of these basins, the extrapolated size of the youngest basin at Steenbokfontein Cave seems bigger than those observed for Eland's Bay Cave (J. Parkington pers. comm.). Moreover, both of the basins observed in Steenbokfontein Cave are filled either by totally burnt material (Layer 4a) or by several burnt and ashy units alternated with well preserved deposits (Layers 1 to 3). It is possible that such basins were intended for a variety of different activities at Steenbokfontein Cave.

An alternative interpretation is that the function of such features might not have changed substantially through time. The observed burnt lenses could be just the reflection of post-depositional fires with their origins from outside the cave or from slow burning and unattended fires left behind after a visit was completed. Certainly, a more definitive explanation for these basins will not only require the analysis of their contents, but also the enlargement of the excavated area to control for any spatial variability within them.

THE TEST PIT EXCAVATIONS AT SEVERAL MEGAMIDDENS:

Excavations were undertaken in previously sampled megamiddens (Horwitz 1979; Buchanan 1988; Yates 1989) and in three other megamiddens recently located by J. Parkington and myself. Depending on the logistics available during field work and the nature of the sediments, either all of the material excavated from a test pit (consisting mainly of shell remains) was sorted on site or, alternatively, only a number of buckets were sorted from each stratigraphic layer and the rest discarded. In the first of these cases, the volume associated with the recovered faunal and cultural materials is referred to as excavated deposit, in the second case, the associated volume is regarded as sampled deposit. Unsorted shell bulks were also obtained for each sampled megamidden.

Malkoppan

This large open shell midden is presently visible on the beach side of a gravel road approximately 7 km south of Lambert's Bay (Fig. 4.2). Its width varies from 30 to 50 m and several low shell mounds are visible along a 2 km north-south axis. To the north of the sampled area, Malkoppan may well merge with another open shellmidden ("Lambert's Bay Dump") dated to 2770 ± 60 BP (Buchanan 1988; Table 4.1). To the south, Malkoppan mounds might also merge with middens present at Grootrif (Fig. 4.2, see below). Nevertheless, this apparent spatial

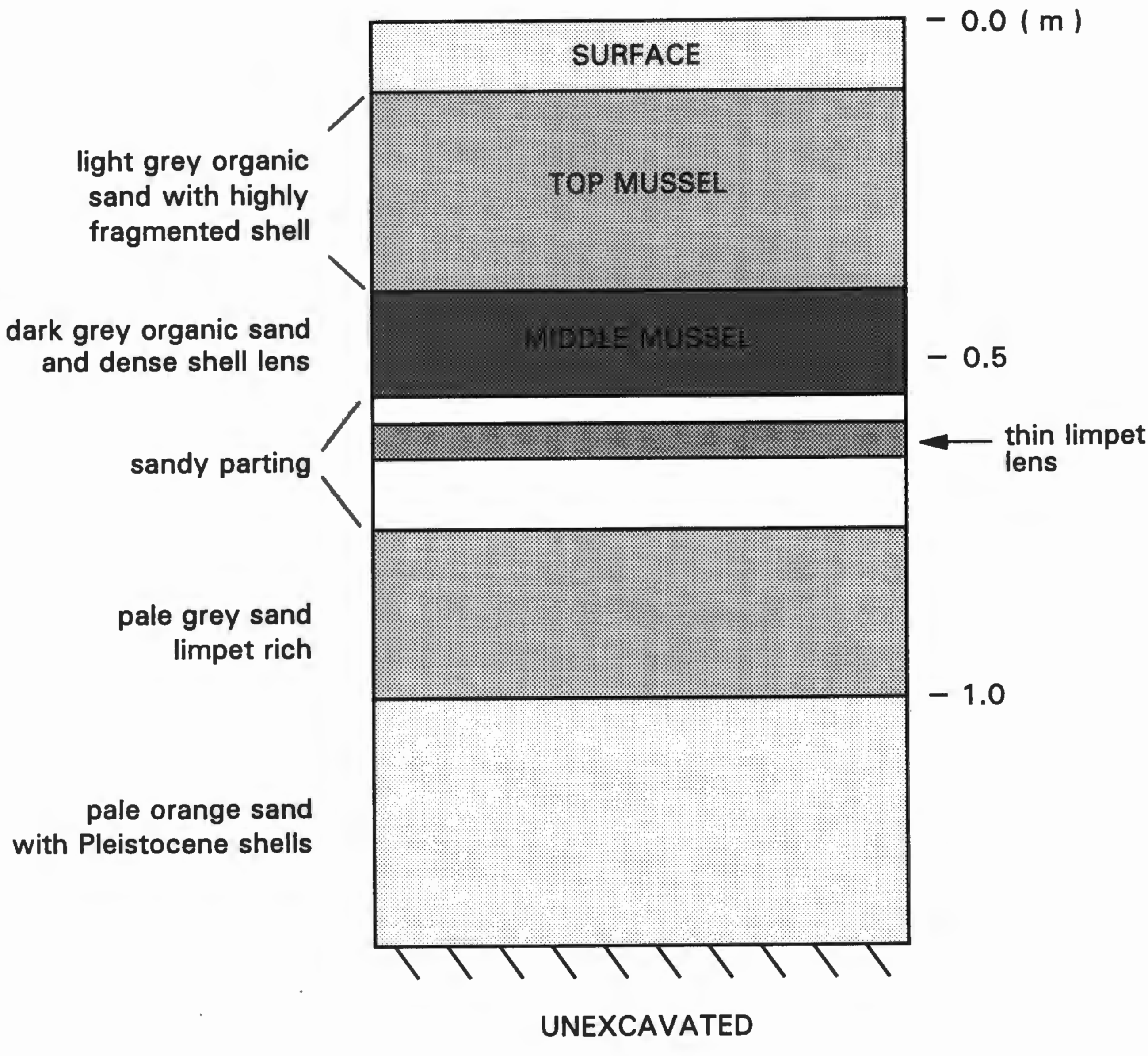

Figure 4.10: Sketch profile of Malkoppan stratigraphy.

continuity between these megamiddens still needs to be assessed with further field work involving test pit excavations and dating. No other previous excavation had taken place in Malkoppan.

Excavations proceeded from the midden's section exposed as a result of road works. One test pit was excavated to a depth of 1.3 m. The initial excavated surface comprised an area of 0.5 x 0.8 m. This area increased to 0.7 x 1.0 m and later on decreased more or less to its previous dimensions, depending on the speed of sieving and processing of the material during field work. This site is characterized stratigraphically by a superimposed series of shell middens separated by sandy partings. The surface layer is represented by 10 cm of dark organic sand with highly fragmented shell (Fig. 4.10). The next 40 cm consist of light grey organic sand with scattered shell. This layer was followed by a 15 cm thick dark grey shell lens of densely packed black mussels (*C. meridionalis*) held in an organic sand matrix. A date of 2460 ± 50 BP (Table 4.1) was obtained for this shell lens. The next 20 cm below this shell lens was characterized by grey sandy deposits including a very thin lens of limpets (*Patella* spp). A 25 cm thick layer of pale grey sand containing a fair amount of large limpets was encountered immediately below (Fig. 4.10). A date of 4230 ± 60 BP (Table 4.1) was obtained from this layer. The lowermost deposit consist of culturally sterile Pleistocene orange beach sand and fossil mollusc shells including one extinct species. Table 4.2 shows the volumes of deposit sampled from Malkoppan.

Grootrif

This large open shellmidden is located about 3 km south of Malkoppan opposite Steenbokfontein farm and between the dirt road to Lambert's Bay and the beach (Fig. 4.2). Grootrif is about 60 m wide, with a series of gentle sloping shell mounds extending over 300 m along the beach. Scattered shell are visible between mounds. Excavations proceeded at one of these mounds, namely Grootrif D ('GFD' in the SARU data base information). Previous excavations had taken place at Grootrif D in 1985 (Yates 1989), which consisted of a small test pit (0.3 x 0.3 m) down to a depth of 1.3 m. Several radiocarbon dates were obtained as a result of this excavation (Buchanan 1988; Yates 1989).

For the purpose of my thesis project, a 0.8 x 0.4 m test pit was dug to a depth of 2.0 m. The section exposed as a result of the 1985 excavation was reopened and used as a stratigraphic guide. As in the case of Malkoppan, the stratigraphy of Grootrif D is characterized by a superimposed series of shell middens separated by sandy partings. A total of 18 units were

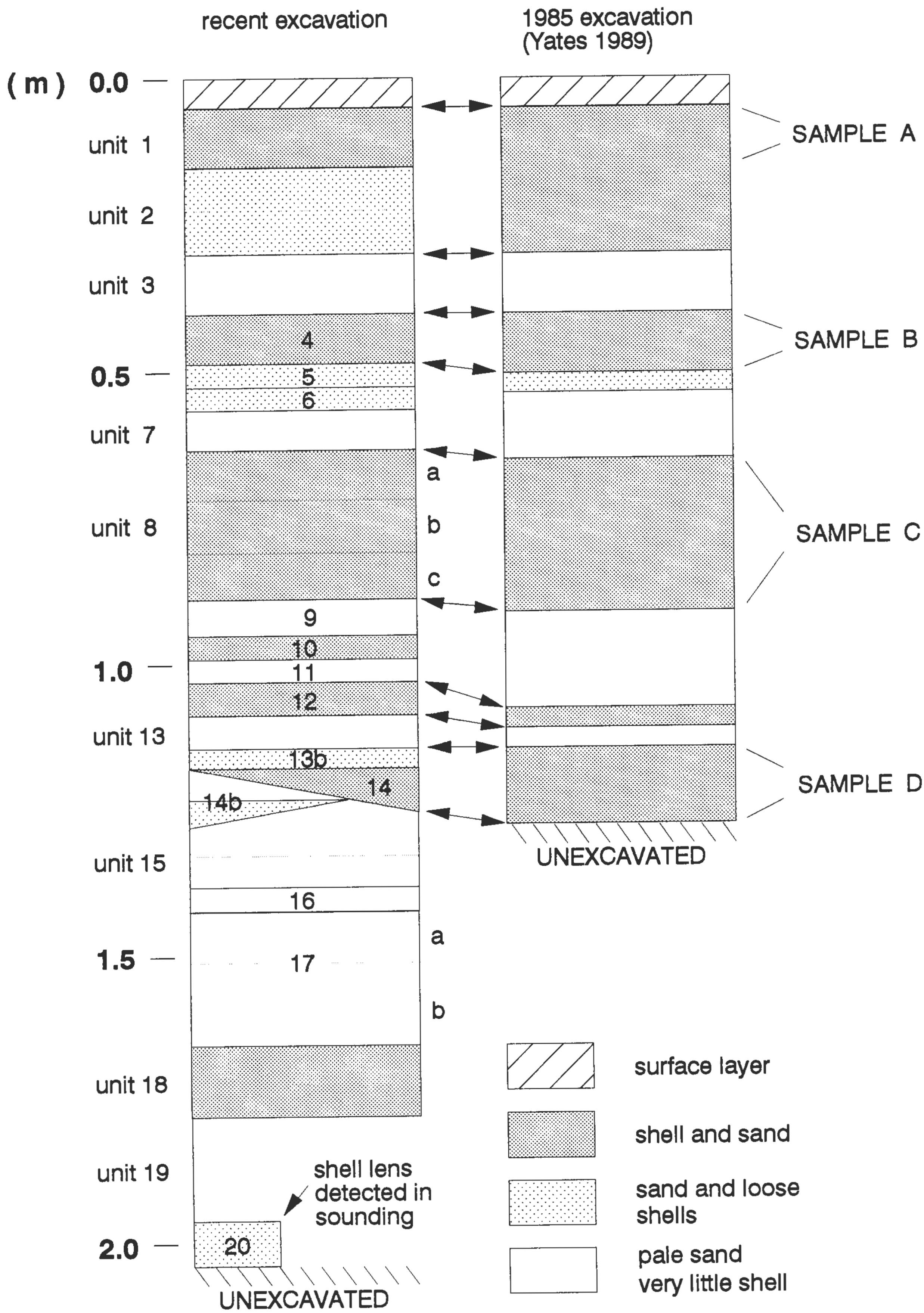

Figure 4.11: Sketch profile of Grootrif D midden from both recent and previous (1985) excavations. Stratigraphic equivalence between the two columns is indicated by arrows. Numbers in section refer to units.

distinguished, four of which reached below the depth of the previous excavated test pit. The stratigraphic equivalence between these units and earlier excavated layers is shown in Figure 4.11.

The top 65 cm (units 1 to 7) are a succession of shell and sand deposits, each of them varying in thickness (between 5 and 10 cm) and density of shell. Two dates were obtained by R. Yates from samples equivalent to units 1 and 4: 2290 ± 50 BP and 2470 ± 60 BP (Table 4.1), respectively. Unit 8 is a 25 cm thick layer of dense shell represented mainly by black mussels. A date of 2540 ± 50 BP was also obtained by R. Yates for this unit (Table 4.1). A series of alternating sandy and shell lenses, each of them no thicker than 7 cm, were encountered from unit 9 to 14b. Another date obtained by R. Yates of 2680 ± 60 BP (Table 4.1), from a depth of 1.2 m, can be securely associated with unit 14 (Fig. 4.11). Units 15 to 17 are characterized by pale, near sterile sand with only few shells. These and the following units were dug below the level reached by the 1985 excavation. Limpets were relatively common in these newly encountered units when compared with the above ones. A moderately dense layer of shell (unit 18) was observed below unit 17. A date of 2830 ± 60 BP was obtained for unit 18 (Table 4.1). A small sounding was dug down from unit 18 before the exposed sections collapsed. A shell sample was obtained at a depth of 2.0 m below the surface (Fig. 4.11), subsequently dated to 3030 ± 20 BP (Table 4.1). Table 4.2 shows the volumes of deposit sampled from Grootrif D.

Cape Deseada Midden

Cape Deseada Midden is another large open midden located just behind the west facing rocky shore of Baboon Point (32°19' S, 18°18'50" E). The dark grey surface scatter of shell and organic sand is visible from Eland's Bay Cave, located some 150 m distant (Fig. 4.12). Cape Deseada Midden is 20 to 30 m wide and runs north-south over a distance of 250 m. Two square meters (Test Pit 1 and 2) were dug to respective depths of 1.0 and 1.3 m. This site is characterized stratigraphically by a dominant matrix of fine and organic sands, with some shell lenses present at different depths from the surface. No other previous excavations had taken place in this midden, as this site was only recently located.

Test Pit 1: The top 30 cm are represented by light brown sand, abundant roots, comminuted shell, and derived midden material from below. The next 35 to 40 cm are grey brown sand, scattered shells and some shell lenses. Two distinct shell lenses were observed at a depth of 35 and 50 cm from the surface (Fig. 4.13). A date of 2450 ± 50 BP (Table 4.1) was obtained for the

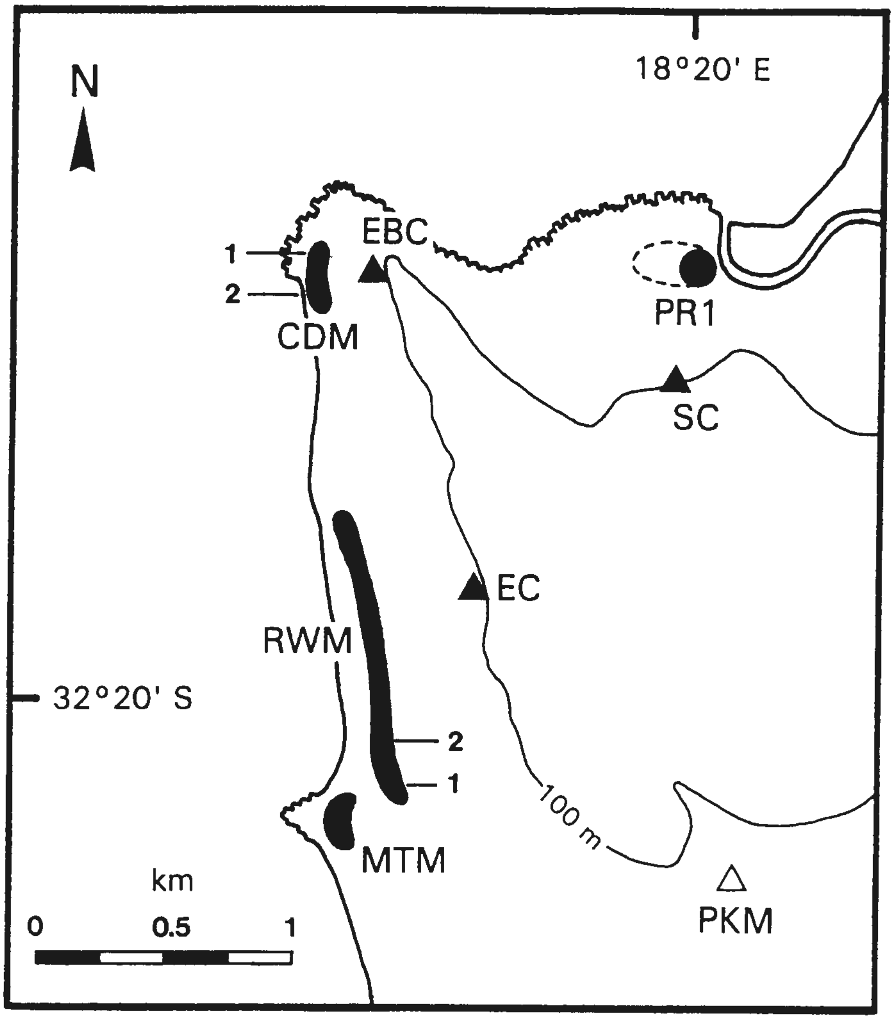

Figure 4.12: Geographic location of megamiddens, caves (filled triangles) and shelters (open triangles) in the Eland's Bay area. CDM Cape Deseada Midden; EBC Eland's Bay Cave; EC Eagle Cave; MTM Mike Taylor's Midden; PKM Pancho's Kitchen Midden; PR1 Public Resort 1; RWM Railway Midden.

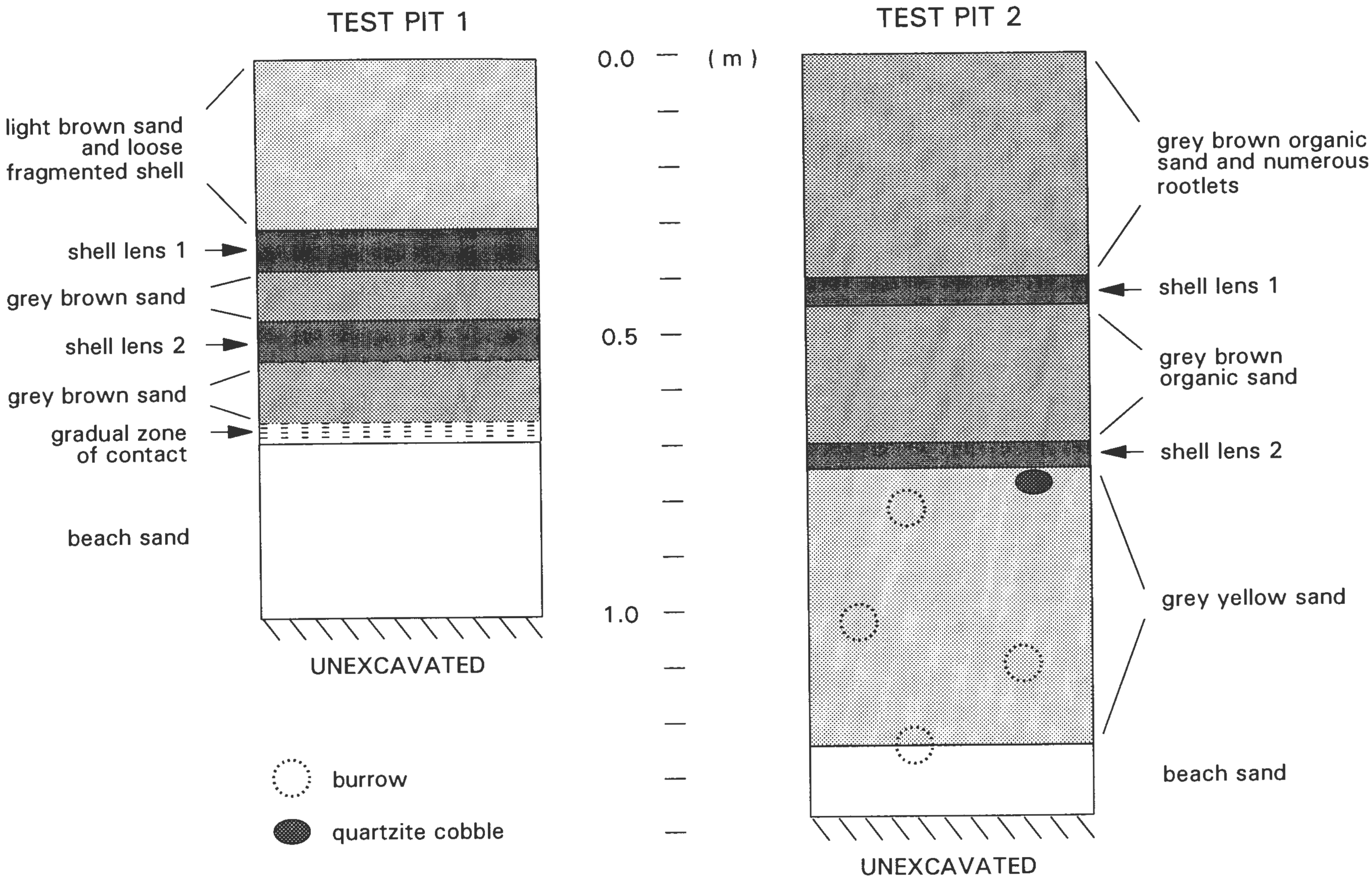

Figure 4.13: Sketch profiles of test pits at Cape Deseada Midden.

lower most shell lens. Towards the bottom of this layer, a gradual zone of contact with the layer below it was observed. The bottom deposit is sterile beach sand of light yellow colour, with abundant shingle and occasional whole limpets.

Test Pit 2: This sounding is located about 150 m south of Test Pit 1. The top 70 cm are defined by grey brown organic sand containing numerous roots. In this layer two shell lenses were observed at 40 and 70 cm from the surface. Both were difficult to trace on the sections. A date of 2500 ± 50 BP (Table 4.1) was obtained from the lower most shell lens. The next 55 cm were represented by grey yellow sand containing very diffused shell and numerous burrows. A shell lens of indeterminate origin (archaeological or beach) was observed at the bottom of this layer. This midden grades into sterile bright yellow beach sand (Fig. 4.13). Table 4.2 shows the volumes of deposit sampled from Cape Deseada Midden.

Railway Midden

This midden is located approximately 1 km south from Cape Deseada Midden, and immediately north east from another megamidden named Mike Taylor's Midden (Fig. 4.12). A field survey conducted in the area in order to determine the edges of Railway Midden revealed that this midden might be the northern extension of one of the shell mounds observed on the N-E limits of Mike Taylor's Midden. Railway Midden is approximately 70 m wide and 800 m long, and runs on a north-south axis between the present dirt road and railway line (32°20' S, 18°19'06" E), with its mid point extending to the east side of the rail way line. Very few dispersed shells were observed on the surface, and only occasional dune mole heaps reveal the presence of this shell midden. Two test pits, both slightly larger than 1 m^2, were dug to a depth of 1 m each. As with the case of Malkoppan and Cape Deseada Midden, no other previous excavations had taken place in Railway Midden since its discovery by J. Parkington in 1991.

Test Pit 1: It is located 40 m south of the road gate, behind Mike Taylor's Midden. A 7 cm thick layer of light brown orange road fill lies on top of the original midden surface. Below this clay-rich material, the top 42 cm are characterized by grey brown sand with dispersed shell fragments. This deposit was followed by a 14 cm thick compacted shell and sand lens of dark grey colour (Fig. 4.14). This shell lens was dated to 2450 ± 50 BP (Table 4.1). A 15 cm sandy layer, showing a gradual colour change in the matrix from grey to nearly white, followed. Sterile dune sand was encountered below (Fig. 4.14).

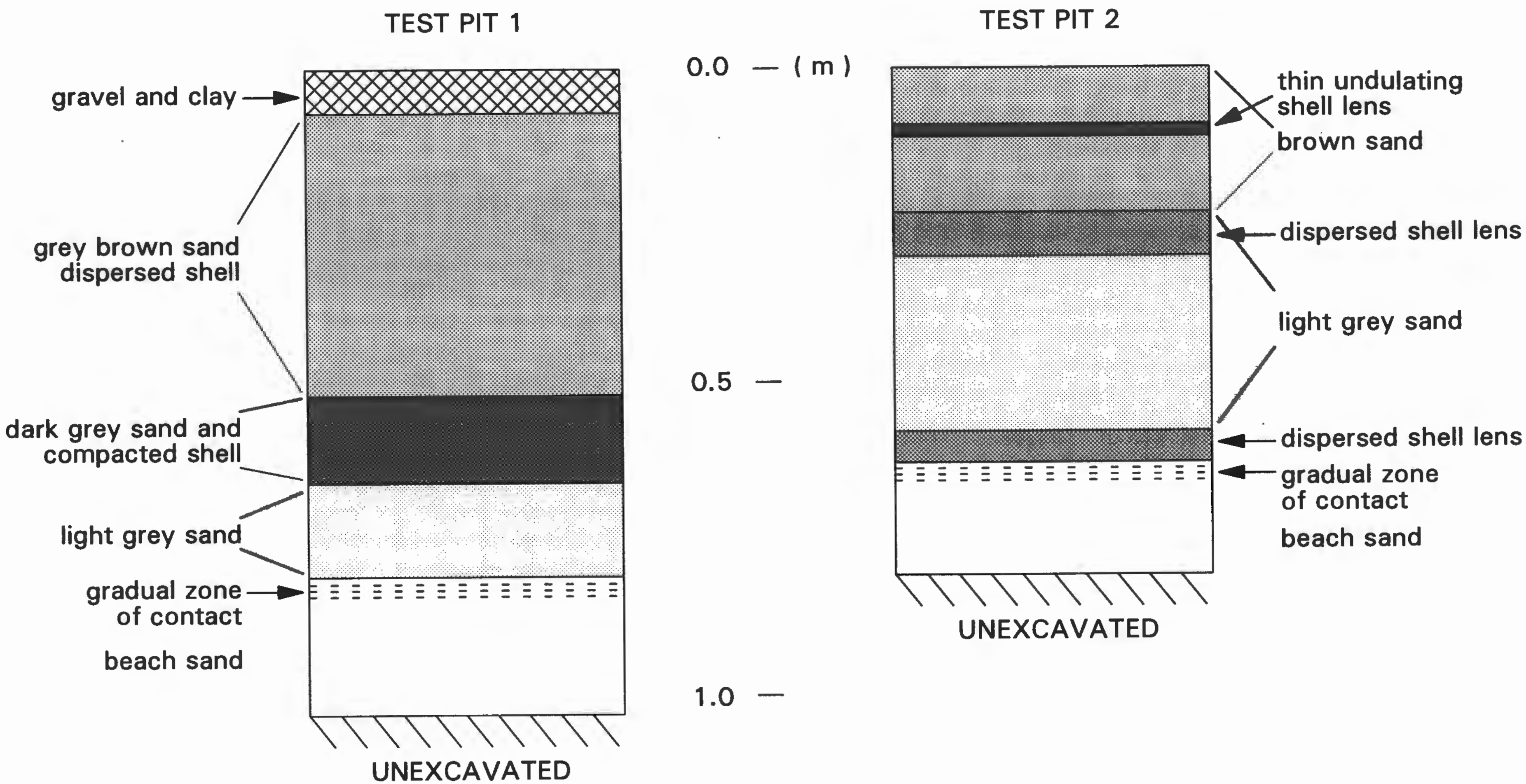

Figure 4.14: Sketch profiles of test pits at Railway Midden.

Test Pit 2: This pit was excavated approximately 150 m north of Test Pit 1, on the east side of the railway line (Fig. 4.12). The top 22 cm are characterized by brown, root infested sand. A 2 cm thick undulating lens of fragmented shells was observed at a depth of 10 cm. The next 40 cm of deposit are light grey sand, few roots and scattered shell (Fig. 4.14). A lens of fragmented shells was observed in the top 7 cm of this layer, which was subsequently dated to 2400 ± 40 BP (Table 4.1). Another undulating and fairly dispersed shell lens was observed at the bottom of this 40 cm thick layer. This 5 cm thick shell lens seem to lie in secondary context, as some evidence for disturbance was observed. A graded contact zone of grey to yellow sand, leading into white sand, followed (Fig. 4.14). Table 4.2 shows the volumes of deposit sampled from Railway Midden.

Mike Taylor's Midden

This large open shell midden is located just behind the reefs of Mussel Point (32°20'15" S, 18°19' E) (Figs 4.2 and 4.12). Scatters of shells of differing density and degree of fragmentation are visible over an area of 200 x 120 m, although the true limits of this megamidden almost certainly exceed these dimensions. A series of vegetated shell mounds, some of them over 10 m long, characterize the undulating surface of Mike Taylor's Midden. One of these large mounds, consisting of highly compacted surficial shell deposits, has been used as a car park in the last 25 years.

Mike Taylor's Midden has received considerable attention by several archaeologists in the last 20 years. Initial excavations at this megamidden were undertaken by M. Taylor in 1973. This excavation (Fig. 4.15: E1) consisted of a 1 m deep test pit, from which a total of 3.8 m^3 were removed. Several shell lenses and a bottom layer of mostly clean sand and dispersed shell were encountered. The basic stratigraphy and cultural contents, as well as fauna (shell and bone) were described by Horwitz (1979). During the undertaking of this thesis project, a date of 2270 ± 25 was obtained for the lower most layer observed in this excavation (Table 4.1).

Whilst M. Taylor was working in E1, another excavation was started by F. Silverbauer and M. Cronin (Fig. 4.15: E2). [Buchanan (1988: 182) erroneously reports this and M. Taylor's excavations as having occurred respectively in 1976 and 1974]. In this instance, an area below a pile of rocks, thought to be a headstone marking the location of a burial, was chosen for archaeological investigations. No burial was found and, according to excavation notes, a few faunal and charcoal samples were kept. These samples, however, have not been located in

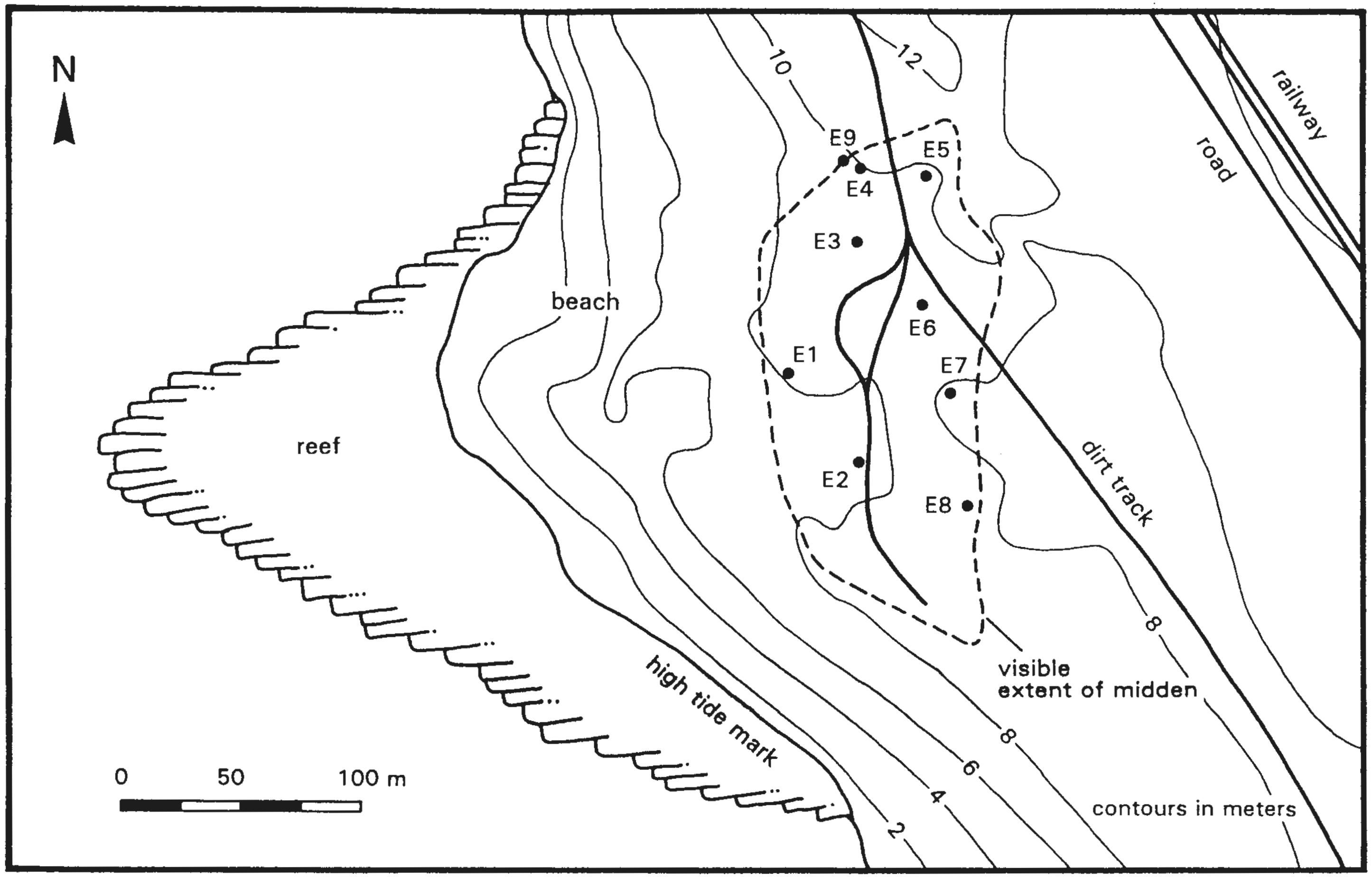

Figure 4.15: Site plan of Mike Taylor's Midden showing the location of past and recent test pit excavations.

storage. Reference was made in the notes to abundant charcoal, and the presence of fish and bird bones. Unfortunately, only partial buckets counts were kept, and a total estimated 0.5 m^3 seem to have been excavated. These estimates do not coincide with Buchanan's (1988: 182) reading of Siverbauer and Cronin's field notes.

In 1981, W. Buchanan initiated an excavation programme at Mike Taylor's Midden. A 1 m deep test pit (Fig. 4.15: E3) was dug with the purpose of obtaining charcoal for radiocarbon dating. A date of 2130 ± 50 BP was obtained from a sample retrieved at a depth of 20 cm below the surface and another of 2460 ± 50 BP was obtained from a depth of 1.0 m (Buchanan 1988; Table 4.1). No record of the total volume excavated was kept. In the following year, three 1 m^2 test pits were dug in 10 cm spits, one of which (E3A, adjoining E3) was aborted at spit 5. The other two test pits were dug on either side of the dirt road that runs through the length of the midden (Fig. 4.15: E4, E5). E4 was dug to a depth of 0.8 m and E5 to a depth of 1.2 m. Two dates were obtained from E4: 1780 ± 60 BP and 2090 ± 50 BP, at 30 cm and 70 cm below the surface respectively (Buchanan 1988) (Table 4.1). A bottom layer (1.2 m deep) in E5 was dated to 2820 ± 50 BP. Only those field notes regarding E4 have survived until today, but summary description of laboratory analyses are available for E3, E4 and E5. It is also unfortunate, that none of the archaeological remains recovered from these excavations (with the exception of a few charcoal samples) have been located yet. Nevertheless, a qualitative description of fauna, stone artefacts and pottery, as well as a detailed account of the variability of charcoal contents in each test pit was provided by Buchanan (1988). Subsequent to this work, three depth soundings (Fig. 4.15: E6, E7, E8) were dug by Buchanan with the sole purpose of estimating the depth of the deposit at different points of this large midden.

Recent excavations at Mike Taylor's Midden:

For the purposes of my thesis project one 1 m^2 test pit was dug to a depth of 1.6 m, and an additional 30 x 50 cm column was also dug immediately adjacent to this test pit to a depth of 60 cm. These excavations (Fig. 4.15: E9) were placed 3 m away from E4 to the north-west. The stratigraphy revealed in E9 resembles the one observed in Grootrif D, in that several dense shell lenses of various thicknesses were alternated with marked sandy partings. With the exception of the surface layer, a total of 12 units were observed (Fig. 4.16).

The top most layer is defined by a 20 cm thick brown and sandy shell lens (BSS series). Big fragments of barnacle shell were encountered frequently amongst black mussel and limpet

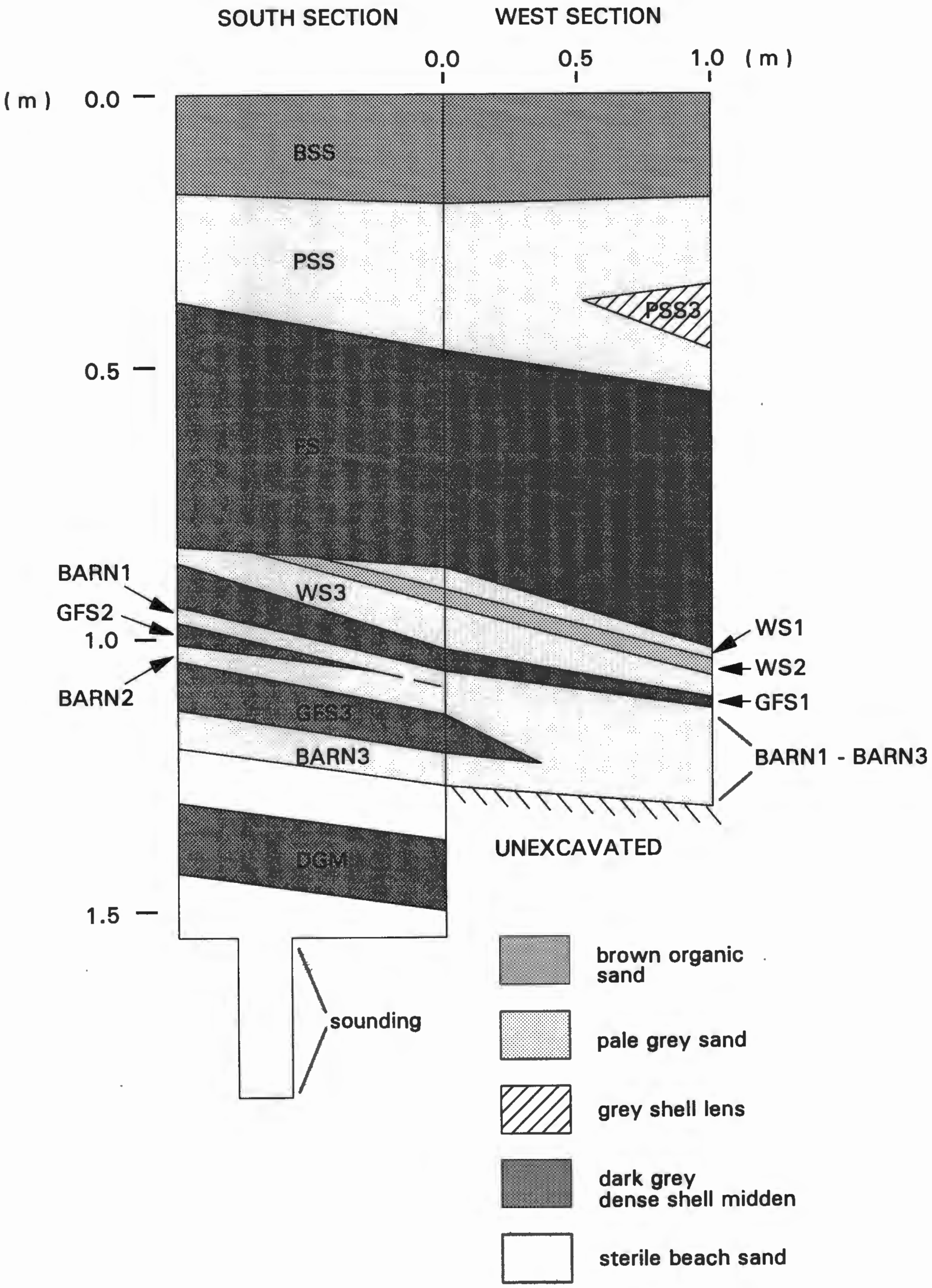

Figure 4.16: Sketch profile of test pit E9 at Mike Taylor's Midden.

shells. A shell sample from BSS was dated to 985 ± 25 BP (Table 4.1). Evidence for disturbance was observed around root clusters and animal burrows. The following 20 to 30 cm of deposit are characterized by a pale grey, sandy shell midden, named PSS. Barnacles continue to appear frequently. Within this layer, the remains of what seems to have been the periphery of a hearth was observed in the north and west sections (Fig. 4.16: PSS3). A shell sample was obtained from PSS3 and dated to 1735 ± 30 BP (Table 4.1). Below this pale grey layer, approximately 50 cm of dark grey and dense shell midden was observed. The colour of this midden (FS series) is certainly a reflection of the abundant charcoal and the overwhelming dominance of black mussels in the shellfish assemblage. Three dates were obtained from FS subunits: 2000 ± 25 BP (FS1), 2070 ± 25 BP (FS3), and 2160 ± 50 BP (FS6b), at 60 cm, 70 cm and 100 cm depth respectively (Table 4.1). The next 10 to 12 cm of deposit are characterized by a succession of relatively thin dark shell lenses and light coloured sandy partings of similar depth. The WS series is represented by a high number of whole black mussel shells, in contrast to the frequently broken black mussel valves in the deposits immediately above and below. Differences in colour between WS1, WS2 and WS3 are mostly a reflection of different charcoal concentrations. Such differences were also encountered within WS3, where a darker facies was observed in the north-west corner. A shell sample recovered from WS3 was dated to 2100 ± 30 BP (Table 4.1). Below the WS series, several shell lenses represented by grey fragmented shell (Fig. 4.16: GFS) embedded in a dark matrix alternate with light yellow and very sandy deposits where unbroken barnacle shells are conspicuous (Fig. 4.16: BARN). GSF1 was found throughout the excavated square, but this was not the case of GFS2 and GFS3, which disappear towards the north-west corner of the excavation. Because of this facies differentiation of GFS2 and GFS3, units BARN1, BARN2 and BARN3 merge as a single 15 cm thick sandy layer in this particular corner. BARN3 becomes darker towards the south-east corner, perhaps an indication of another spatial differentiation. A shell sample obtained from BARN3 was dated to 2220 ± 60 BP (Table 4.1). Below this unit, the excavation was reduced in area to a 30 x 70 cm "window". A 10 cm lens of light yellow sterile sand followed BARN3, below of which another very compacted and dark grey shell lens (Fig. 4.16: DGM) was found. DGM is 13 cm thick and closely resembles the FS series in colour, degree of shell fragmentation and shellfish composition. A shell sample from DGM was dated to 2340 ± 60 BP (Table 4.1). Before the excavations ended, a 40 cm deep and narrow sounding was dug below DGM in order to check possible shell lenses lying below this mark. Nothing, but sterile sand, was found. Table 4.2 shows the volumes of deposit excavated from Mike Taylor's Midden.

OTHER SITES ENCOUNTERED DURING COASTAL SURVEYS

Eagle Cave

The field survey along the cliffs between south of Eland's Bay Cave to Waterkloof yielded very few observations and mostly confirmed those made by members of SARU in previous field surveys. In general, wherever the slightest overhang or prominent rock occurred on the footslopes, a very ephemeral scatter of shell was encountered. Mussel shells were overwhelmingly dominant, with limpets and whelks occurring very seldom and only in few of the localities. Pottery was seen in one scatter, represented by a number of potsherds.

The exception of this survey was a series of recessed shelters at the base of a massive overhang known by SARU members as Eagle Cave (Figs 4.1 and 4.12). An eagle roost occurs in the vicinity of this overhang, which probably explains the numerous bones, particularly dassie skulls found just below and beyond the dripline. Two shelters of archaeological relevance were encountered. The first, located at the south end of Eagle Cave has a fairly rich surface scatter of Middle Stone Age flakes, most of them in quartzite, with hornfels, silcrete and quartz less frequent. MSA artefacts were found all along the length of Eagle Cave including the more prominent recessed shelter to the northern end.

The surface of this second large overhang is raised behind a retaining wall of tumbled rock. A thick layer of dassie dung blankets the floor and approaching slopes. Initially, two small 25 x 25 cm soundings in the center and back of the cave encountered a hard grey white ash body at 25 cm depth below the dung. This deposit contained no artefacts or charcoal, but a few fragments of burnt black mussel shells were observed. Although the shell remains were clearly introduced by people, the origin of the ash was not so clear. A third sounding of similar dimensions was dug in the front of the cave in order to confirm the archaeological status of the deposit. In this instance, somewhat different material was found. The dung layer was shallower, giving way at about 100 mm in depth to an extremely hard, dark grey sediment. Just below the surface of this deposit, a 5 cm thick lens of largely whole, but very brittle black mussel shells in association with big pieces of charcoal, corm casings and grass remains was encountered. These contents were sampled over an area of 15 x 10 cm for radiocarbon dating purposes. A charcoal date of 2910 ± 60 BP (Table 4.1) was obtained for this sample.

Dune cordon sites

A number of sites were observed along the narrow dune cordon south of Mussel Point. The sites were generally found in low, deflated and unvegetated sandy areas and only very few where vegetation has settled. The majority of these sites were observed between Soutkloof and Draaihoek farms (Fig. 4.17), where the dune cordon becomes less vegetated and relatively flat.

As a result of this survey, eleven (11) sites were observed along the coastal fringe of Langdam, twenty two (22) near Soutkloof, and nine (9) near Draaihoek. All of these sites consisted of thin and dispersed shell scatters in association with bones of different species (tortoise, birds, fish, and small quantities of bovids), ostrich eggshell fragments (OES), stone artefacts (flakes and grindstones) and, to a lesser extent, pottery. In many cases the edges of these middens were difficult to define, because several of these shell middens seem to merge with one another. Most of these sites, with the exception of one or two cases, appear to be the remains of relatively short occupations.

Several of these sites that showed no trace of pottery were sampled and dated. One *in situ* sample obtained from a dune section in Langdam farm (LD9: 32°25' S, 18°20' E) yielded a date of 2150 ± 20 BP (Table 4.1). This site is located next to a farm road across the dunes, no more than 40 m away from the high tide mark (Fig. 4.17). Its dimensions are 20 x 40 m on a W-E axis and most of the remains consisted of abundant black mussel shells and few tortoise, bird and bovid bones, as well as one OES bead and quartz flakes.

Another site located just south of Soutkloof farm (SK1: 32°26'45" S, 18°20'10" E) was sampled (Fig. 4.17). This is perhaps the only dune cordon site that contains faunal remains in relatively great quantities with the addition of at least two stone features and several stone artefacts, including formal tools (adzes and one backed scraper). Some potsherds were also present on the surface of the site, which encompasses an area of 20 x 45 m. A close inspection around the margins of the site revealed three different stratigraphic horizons. The topmost layer is represented by at least 10 cm of beach sand containing most of the cultural remains. Beneath it, a 10 to 15 cm thick layer of highly organic sediments containing densely packed black mussel shells was observed. An *in situ* shell sample obtained from this horizon was dated to 3080 ± 60 BP (table 4.1). This layer was followed by sterile beach sand. With pottery present, it seems reasonable to conclude that this site constitutes a palimpsest of at least two occupations, one dating to *c.* 3000 BP and another one dating to the last 2000 years.

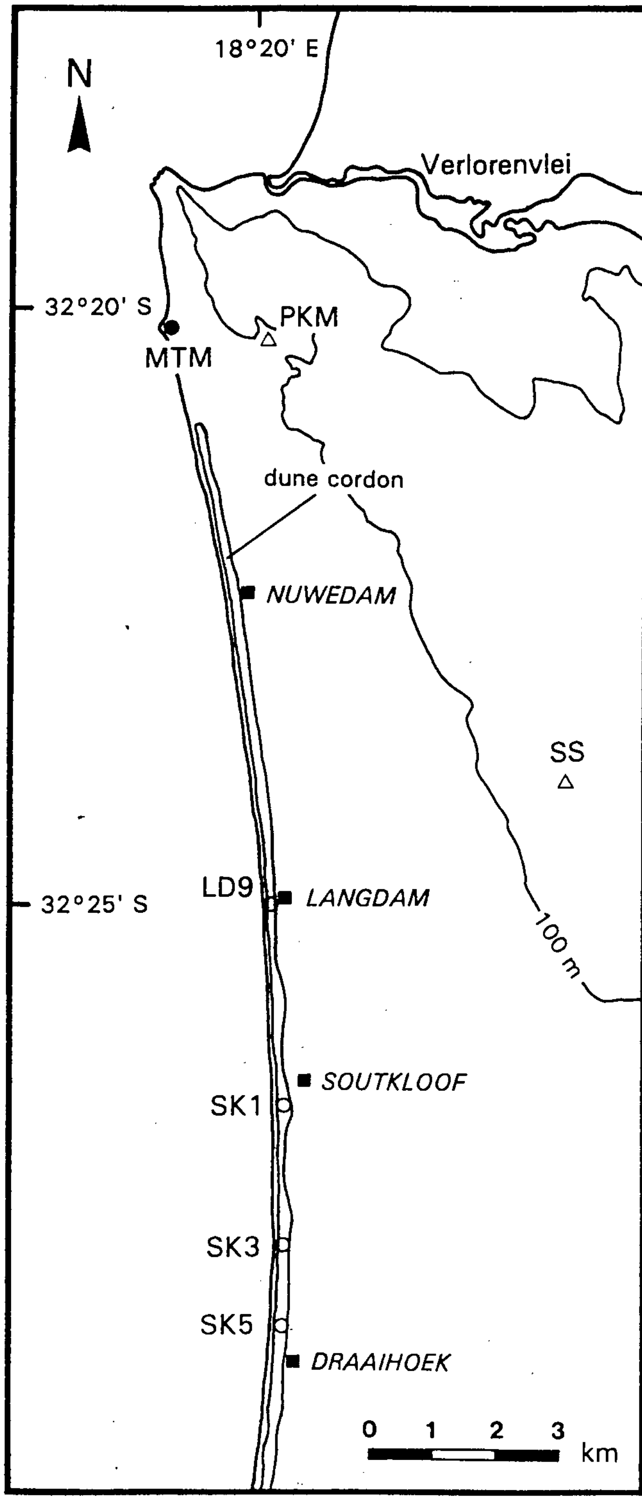

Figure 4.17: Geographic location of dune cordon sites (open circles), nearby shelters (triangles) and largest megamidden (filled circle) in the Eland's Bay area. LD9 Langdam 9; MTM Mike Taylor's Midden; PKM Pancho's Kitchen Midden; SK1 Soutkloof 1; SK3 Soutkloof 3; SK5 Soutkloof 5; SS Scorpion Shelter. Present farm settlements are represented by filled squares.

Two other sites located on Soutkoof farm (SK3: 32°27'50" S, 18°20'10" E; and SK5: 32°28'35" S, 18°20'10" E) (Fig. 4.17) were also sampled and dated. SK3 is 60 m long by 15 m wide, and consist of four main shell scatters of variable composition oriented in a north-south axis. Scatter B contained thin dispersed shells (limpets and black mussels), quartz and quartzite chunks and bird bones as well as sheep bones and big potsherds around the periphery. A sample from this scatter was dated to 2380 ± 45 BP (Table 4.1). SK5 includes several shell lenses scattered on the surface of low lying dunes, and also a shell lens located in the section of a 2.5 m high dune. Scatter B consisted of 3 x 2 m open shell midden represented by a 10 cm dense shell lens, including fish and bird bones, big fragments of OES and several quartz flakes. A sample was obtained from the densest area of the scatter and dated to 2100 ± 45 BP (Table 4.1).

It is clear that the new set of dates obtained for this thesis project, in conjuction with those established earlier on, provide an opportunity to revise previous settlement patterns suggested in the study area (Buchanan, 1988; Parkington *et al.* 1988; Henshilwood *et al.* 1993), particularly for the megamidden period and during the mid-Holocene. These and other aspects of hunter-gatherer settlement patterns in the Eland's and Lambert's Bay areas are discussed in Chapter 6.

CHAPTER 5

PALAEOENVIRONMENTAL AND PALAEOECOLOGICAL CHANGES: RECENT ASSESSMENTS

INTRODUCTION:

Due to the often poor chronological resolution of palaeoenvironmental sequences, palaeo-economic reconstructions have been concerned primarily with long-term trends, stressing biological and ecological variables. Implicit in these studies, short-term environmental oscillations are frequently regarded as "outliers" from what many researchers consider as the "general trends". The relevance of studying short term and low amplitude climatic fluctuations becomes apparent when it is realized that these are the very ones with which human groups have been challenged decade after decade, from one generation to the next (Moseley *et al.* 1981). An emphasis on short time-scale reconstructions also allows a shift from ecological-adaptationist explanations of economic behaviour to those focusing on sociological and ideological aspects of behaviour, because the latter are often (although not always) expressed in shorter time-scales than the former ones (Bailey 1981).

The relatively rapid changes in settlement and subsistence detected for the last 4000 years in the research area (Chapter 1) demand a resolution in the palaeoenvironmental record close to that of the archaeological data for purposes of meaningful comparisons. Recent palaeoenvironmental research is certainly pointing towards this direction (Chapter 3), although further studies have to be undertaken to provide a more complete picture. Knowing that the impressive changes in settlement and subsistence in the research area involved a marked emphasis in shellfish collection within only one millenium (between 3000 and 2000 BP), I have undertaken palaeoenvironmental research regarding variables potentially involved in such behaviour, namely: i) a high-resolution record of sea level change, and also ii) possible human, as well as biological and physical impact on shellfish populations. Both are presented and discussed below.

FLUCTUATING SEA LEVELS:

Evidence for fluctuating mid-Holocene sea levels rests on three kinds of observations, namely: i) The presence and quantity of various mollusc species with particular tolerances regarding substrate and salinity in archaeological deposits. The presence of such species can be interpreted as indicative of the particular kinds of coastal environs at the time of their collection (e.g. open coast, estuarine, etc...). Any subsequent change in the shoreline configuration would be reflected by the frequencies of these species in local archaeological sequences (Shackleton 1988). In our case here, the razor clam *Solen capensis* is a west coast estuarine species and is regarded as an adequate indicator of sea level change. During periods of relatively high sea levels, estuarine conditions would prevail at river mouths. As an outcome of this process, the habitat of *Solen capensis* is expected to include a wider area around river mouths. Thus, it is also assumed that such changes would imply a greater availability of this species. Consequently, relatively larger quantities of *Solen capensis* are expected to appear in the archaeological record of nearby sites during periods of relatively high sea levels.

ii) Shifts in marine sediment abundances in archaeological deposits can be useful indicators of coastal sedimentation processes. Sea level change has been identified as one of the most important factors involved in long-term changes in sediment budget. Models of coastal morphological responses to sea level change (developed for relatively straight sandy beaches) show that, on the one hand, net onshore aeolian sediment movement and dune formation take place during the falling of sea level in arid and semi-arid areas. On the other hand, off-shore sediment transport and beach erosion are characteristic of transgressive events (Chappell 1982; Orford 1987). Changes of this sort in relation to sea level fluctuations would have played a significant role in sedimentary processes in the study area, as long stretches of sandy beach dominate the shoreline, all of them currently subjected to northwards longshore sediment transport (Miller *et al.* 1993).

iii) Further evidence for sea level fluctuations in the last 4500 years is provided by changes in the mean sizes of *C. meridionalis* and *P. granatina*. As described above in Chapter 3, mean sizes of black mussels and limpets can vary according to the degree of wave exposure. Given the flat topography of various reefs in the Eland's Bay area, the relationship of shoreline profile to sea level would have changed considerably with the advent of small scale variations (± 2m) in sea level. Most important, human access to intertidal reefs would have been expanded or limited depending on the direction of sea level change and profile of the shoreline (exposure or submersion of reefs). Although obvious, it is important to note that, independent of the direction of sea level change, the different zones of the intertidal (high, mid and low) would always have been present at the coastal reefs.

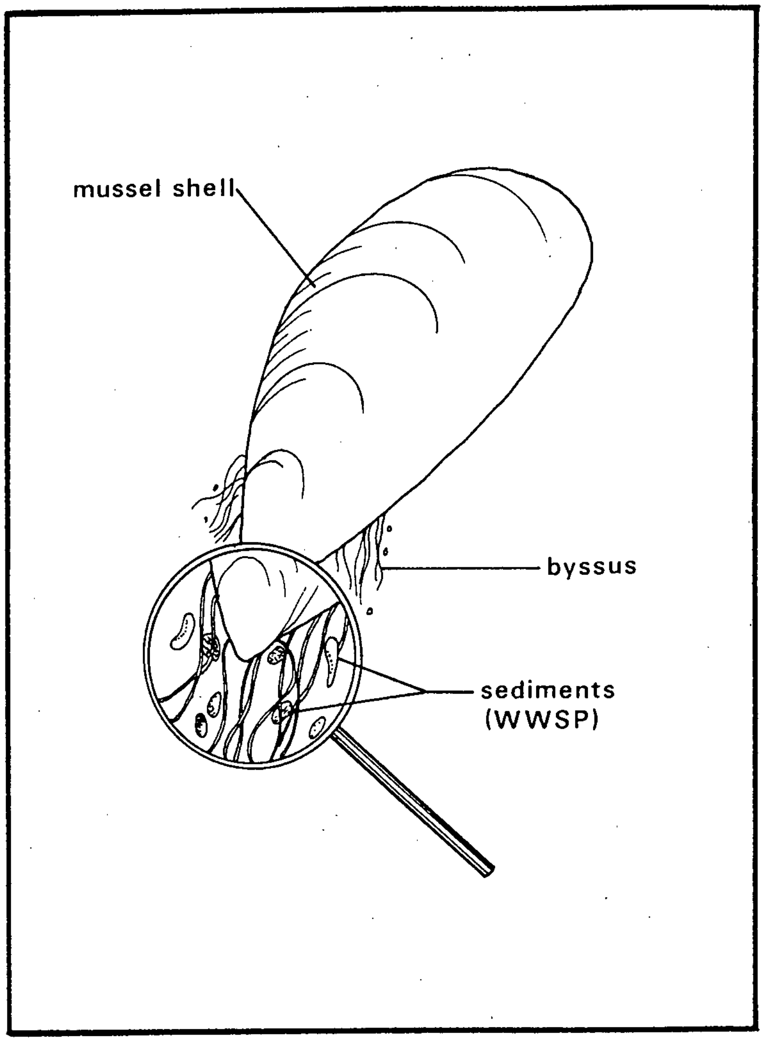

Figure 5.1: Representation of a mussel (*Choromytilus meridionalis*) and its byssus content (WWSP).

Table 5.1: Summary information of shell samples analysed from Tortoise Cave. Several excavation units from each stratigraphic layer were analysed so as to control for spatial variability.

STRATUM	LAYER	NUMBER OF SAMPLES	TOTAL WEIGHT (kg)
1	1b	4	18.3
1	2a	4	11.0
1	2b	5	21.0
1	3a	5	11.2
2	3b	4	13.4
3	5a	5	13.5
3	6	4	13.8
4	7	3	11.6
4	8	3	6.6
5	10	4	8.4
6	11b	1	2.2
6	13a	2	3.4

Most, if not all, shellfish gathering during pre-colonial times took place on rocky shores, as 98% of the shellfish assemblages in Tortoise Cave and other archaeological sites in the area comprised rocky shore fauna (Buchanan 1988). Access to the Bay reefs and Baboon Point involves a walk of 3.8 km from Tortoise Cave, which is not much shorter than the distance of only 4.6 km from this cave to Mussel Point. A small scale change of + 2-3 m in sea level would have allowed shellfish collection only on Baboon Point and immediately adjacent sheltered Bay reefs. A subsequent negative change in sea level of a similar magnitude would have granted access to any reef, including the open and highly productive reef of Mussel Point. Consequently, changes in the mean sizes of black mussels and limpets in the archaeological record can be expected to reflect, at least in part, shifts in the preferred locality for shellfish collection, ultimately a consequence of sea level change in this particular area.

Changes in coastal sedimentation through time were established by analysing water-worn shells and pebbles, a component of coastal site deposits retained by the 3 mm sieve during excavation (Jerardino 1993). Three sites were included in this analysis because of their complementary chronological sequences: Tortoise Cave, Pancho's Kitchen Midden and Steenbokfontein Cave (Fig. 4.1). These water-worn shells and pebbles are securely identifiable as of marine origin and comprise part of the coarsest sediment fraction available on intertidal reefs. It is assumed that changes in coastal sediment budget would affect quantities of both the finest fraction (sands) and coarsest fraction of marine sediments in similar ways. Water-worn shells are worn and polished shell particles derived from marine intertidal species (e.g. *C. meridionalis*, *D. serra*, *Burnupena* spp and barnacles), ranging approximately in size between 2 - 20 mm. Water-worn pebbles are also worn and polished particles of mineral origin, most frequently including those of quartzitic source. The size of water-worn pebbles ranges from 2 to 15 mm.

The sediments with which we are concerned here (water-worn shells and pebbles) were almost certainly brought on to the site as part of the byssus contents of mussels collected from nearby rocky reefs (Fig. 5.1). Personal observation on recently collected mussels supports this second assumption. Water-worn shells and pebbles were observed clinging on mussel byssus, and only a few sand grains were found trapped inside these bivalves. These fine fraction sediments, however, are not part of this study. No water-worn shell or pebble was observed clinging on limpets or whelks, which, together with mussels, dominate the shellfish assemblage of shell middens in the research area. The possibility that the sediments here under study could have been transported to sites on peoples fèet and clothing can be discounted, as similar temporal trends in the frequency of such sediments are found in several sites (see below; Table 5.4). Instead, a more random distribution of water-worn shell and pebble frequencies through time could be expected if clothing was a major transporting agent. Clothing can change with the season of occupation and fashion, both of which are expected to be variable through time. Peoples' feet are also unlikely to transport the larger proportion of water-worn shells and pebbles that reach sites. Peoples' feet often keep submerged and wet during the collection of shellfish, a condition that avoids the clinging of sediments (within the size range of water-worn shells and pebbles) to feet and lower legs for long before people return to their camp sites. The presence of byssus contents in archaeological deposits has also been observed in the giant shell middens of southern Brazil, although these were not quantified (Fairbridge 1976).

In this study, the abundance of marine sediments is expressed as weight of sediments per kilogram of *C. meridionalis* shells. For the purpose of interpreting marine sediment abundances, it is also assumed that the amount of sediment trapped in the byssus threads is proportional to the amount of sediments present in the immediate and contemporary marine-aquatic environment. Thus, high ratios indicate large numbers of water-worn shells and pebbles clinging to mussel byssus, due to relatively large amounts of mineral and organic derived sediments present in the immediate marine environment. Low ratios indicate the opposite. It also seems reasonable to assume that most of the *C. meridionalis* were collected in the past approximately at the same water depth, as black mussel beds would have been easily accessible from the mid to low intertidal zones along Eland's Bay shorelines during low tides.

Shell remains (whole remains and fragments) were sorted in the laboratory and identified wherever possible into different species and genera, whereupon minimum numbers of individuals were established. Countable parts and fragments were subsequently weighed by genera and/or species. The number of samples and total shell weight analysed from each stratigraphic layer ranged from 1 to 5 and from 1.7 to 21 kg, respectively (Table 5.1). Size observations were obtained from *C. meridionalis* by measuring the prismatic band width (Buchanan 1985), and on *P. granatina* by measuring the total length of unbroken shells. For the purpose of testing statistical significance in the changes in mean sizes of both species, a model of analysis of variance (ANOVA) was used (Sokal & Rohlf 1981). Statistical analyses were conducted with the Statistical Analysis System package (SAS 1985).

Table 5.2: Habitats of environmentally sensitive molluscs present in Tortoise Cave.

SPECIE	HABITAT	SUBSRATE	TIDE LEVEL
Solen capensis	sheltered, in estuaries	banks of firm clean sand	low spring
Venerupis corrugata	sheltered embayments	sandbanks, or sanded rock pools	low tide and below
Dosinia lupinus[a]	open coast	clean sand	low tide and below
Dosinia hepatica[c]	sheltered estuaries and lagoons	coarse sand to fine muddy silt	low tide and below
Nassarius kraussianus[c]	estuaries and salt marshes	mud and muddy sand	upper-mid intertidal
Assiminea globulus[b]	estuaries and salt marshes	mud and muddy sand	upper intertidal
Clionella spp	mouth of estuaries	under stones in mud or silt	low tide pools
Protomella capensis[c]	sheltered lagoons	sandbanks	low tide and below

[a]*D. lupinus* has also been described by Tankard (Tankard 1985) from geological deposits of Pleistocene embayments in association with several estuarine species.

[b]*A. globulus* is currently present at the Olifantsriver mouth estuary, western Cape (Morant 1984).

[c]Species commonly found among the eelgrass *Zostera capensis*

Table 5.3: Relative abundance of *Solen capensis* and *Venerupis corrugata* throughout the stratigraphic sequence of Tortoise Cave. Abundances are expressed as grams of shell (*S. capensis* or *V. corrugata*) per kilogram of total shell sample.

LAYER	UNIT	*S. capensis*	*V. corrugata*
3b	Victor	0.00	0.26
	Valiant	0.05	0.23
	Wright	0.02	0.03
	XRay	0.01	0.00
5a	UM1/II	0.45	0.03
	UM2/II	1.11	0.16
	UM3/II	0.45	0.00
	UM5/II	0.70	0.15
	UM8/I+II	1.06	0.07
6	SM5/II	0.95	0.03
	SM5/IV	1.07	0.38
	SM6/II	1.15	0.65
	SM7/II	1.55	1.01
7	LM5/IV	3.65	3.95
	LM6/II-IV	9.55	7.49
	LM8/IV	12.01	7.61
8	FU2/I+IV	17.80	12.90
	FU3/I+IV	22.12	23.60
	FU4/IV	35.90	35.00
10	Melanie	0.74	0.87
	Grey Talus	1.11	0.93
	Grey Talus	1.19	0.76
	Lower G.T	7.22	1.35
11b	FBS	51.88	4.66
13a	Ceri	188.78	21.53
	Delta	170.02	10.60

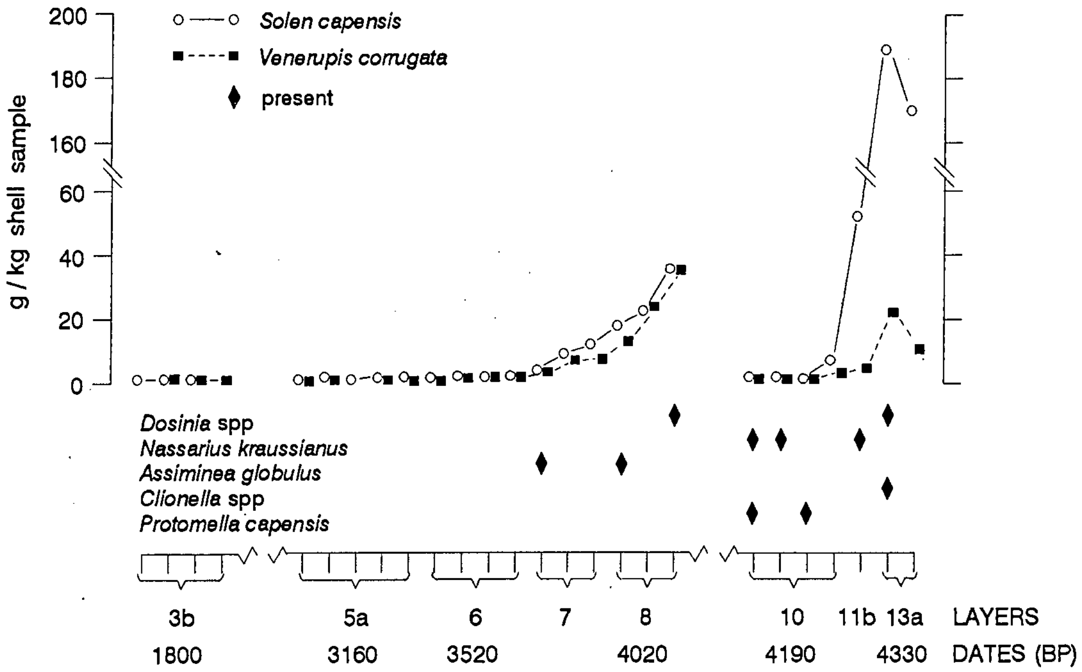

Figure 5.2a. Relative abundance of *Solen capensis* and *Venerupis corrugata* and presence/absence of molluscs species of environmental relevance in Tortoise Cave.

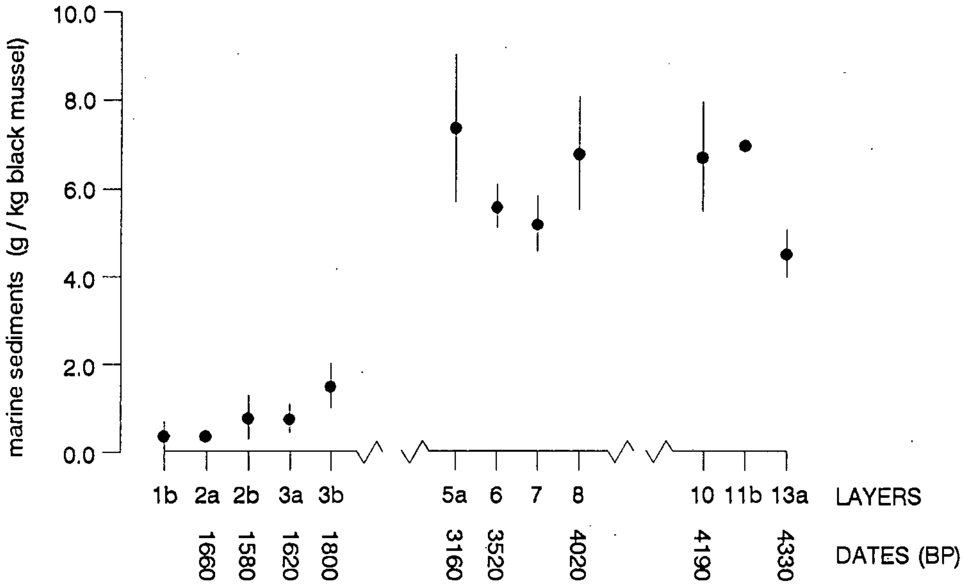

Figure 5.2b. Mean abundance and standard error of marine sediment in each layer of Tortoise Cave sequence.

Results

i) The habitat of the environmental-sensitive molluscan species found in Tortoise Cave deposits is described in Table 5.2. *Dosinia* shells were identified to generic level. This genus is represented on the South African coast by two species shown in Table 5.2.

The abundance of *Solen capensis* and *Venerupis corrugata*, expressed as grams per kilogram of shell sample, through the stratigraphic sequence are shown in Figure 5.2a and Table 5.3. In general, changes in the abundance of *S. capensis* frequently coincide with similar trends for *V. corrugata*. Around 4300 BP *S. capensis* shows the highest abundance in the whole sequence. *V. corrugata* shows basically the same trends but with abundances notably smaller than those of *S. capensis*. These observations, and the presence of *Dosinia* spp., *Nassarius kraussianus* and *Clionella* spp., suggest estuarine conditions at the Verlorenvlei mouth around 4330 BP. Subsequently, the abundances of *S. capensis* and *V. corrugata* decreased greatly to a few grams per kilogram of shell sample. *Dosinia* spp. disappeared from the record and *P. capensis* appears for the first time at the site. At the end of this period of change (4190 BP), conditions at the Verlorenvlei mouth seem to have shifted to predominantly those of a coastal lagoon.

By about 4020 BP, *S. capensis* and *V. corrugata* again show relatively high abundances and *Dosinia* spp. appears in the record once more. These observations suggest a return to estuarine conditions at the river mouth. Some 500 years later both of these species gradually decreased in abundance to minimum values which persisted until 3160 BP. *Assiminea globulus* was present in three of the five layers that comprise the 5a-8 subsequence (Fig. 5.2a). All these last changes confirm another shift from tidal estuarine conditions to a more closed coastal lagoon with salt marshes at the Verlorenvlei mouth.

Deposits dating to between 3160 and 1800 BP are absent in Tortoise Cave. Large open middens located near the Verlorenvlei mouth and dating within this period do not seem to contain any of the species listed in Table 5.2 (Horwitz 1979; Buchanan 1985, 1988). After this approximately 1 300 year long hiatus, *S. capensis* and *V. corrugata* re-occur in the cave deposits (Layer 3b; 1800 BP) in very small quantities. None of the other environmental bio-indicators, however, were found in these units. All of the species listed in Table 5.2 disappeared from the faunal record in the latest occupation layers (Layers 3a to 1a), except for extremely small amounts of *V. corrugata* in no more than 10 samples analysed.

Table 5.4: Mean abundance of marine sediment present at three sites in the research area. Abundances are expressed as grams per kilogram of *C. meridionalis* shell and associated standard error in each layer of the corresponding stratigraphic sequences.

a) Tortoise Cave

LAYER	DATE (BP)	ABUNDANCE
1b		0.38 ± 0.25
2a	1660 ± 45	0.40 ± 0.00
2b	1580 ± 50	0.74 ± 0.28
3a	1620 ± 50	0.72 ± 0.11
3b	1800 ± 60	1.48 ± 0.32
5a	3160 ± 60	7.35 ± 1.65
6	3520 ± 60	5.72 ± 0.42
7		5.18 ± 0.65
8	4020 ± 60	7.07 ± 1.11
10	4190 ± 60	6.92 ± 1.04
11b		6.98 ± 0.00
13a	4330 ± 50	4.52 ± 0.53

b) Pancho's Kitchen Midden

LAYER	DATE (BP)	ABUNDANCE
1	570 ± 20	0.5 ± 0.03
2	880 ± 50	1.3 ± 0.10
3	2640 ± 60	1.5 ± 1.10
4	2940 ± 20	2.2 ± 0.20
5		3.1 ± 0.10
6	3060 ± 60	1.1 ± 0.20
7	3570 ± 60	2.3 ± 0.20

c) Steenbokfontein Cave

LAYER	DATE (BP)	ABUNDANCE
1	*c.* 2200	0.5 ± 0.12
2	*c.* 2400	0.9 ± 0.16
3	2500-2700	0.6 ± 0.16
4a	*c.* 3500	1.6 ± 0.74
4b	4000-6100	5.4 ± 1.52

Table 5.5: Descriptive statistics of *P. granatina* mean sizes and *C. meridionalis* prismatic bands mean widths per strata in Tortoise Cave.

P. granatina

STRATA	n	mean (cm)	std	95% conf. interv.
1	85	50.8	7.3	1.5
2	48	53.2	7.7	2.2
3	60	49.1	8.6	2.2
4	24	54.4	9.4	3.9
5	7	49.3	6.8	6.4
6	9	60.8	7.1	5.5

C. meridionalis

STRATA	n	mean (cm)	std	95% conf. interv.
1	1754	8.2	1.6	0.08
2	442	8.1	1.5	0.14
3	1382	7.2	1.5	0.08
4	954	6.8	1.5	0.10
5	254	7.5	1.5	0.17
6	147	6.6	1.4	0.21

Table 5.6: Summary information of shell samples analysed from Pancho's Kitchen Midden. As in the case of Tortoise Cave, several excavation units from each stratigraphic layer were analysed so as to control for spatial variability.

LAYER	nr. of samples analyzed	total weight (kg)
1	5	60.8
2	3	18.4
3	5	41.8
4	5	38.0
5	3	23.4
6	6	46.9
7	5	25.8

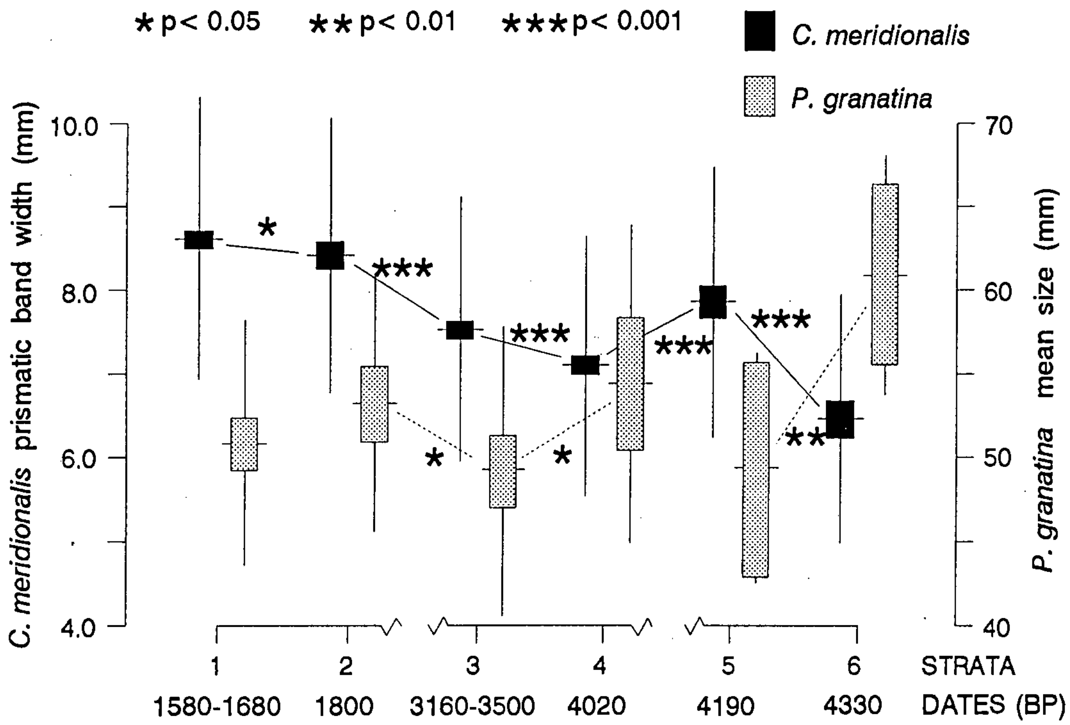

Figure 5.3a. Changes in mean widths and mean sizes of *Choromytilus meridionalis* prismatic bands and *Patella granatina* shells from Tortoise Cave. Rectangles represent 95% confidence intervals and lines standard deviations.

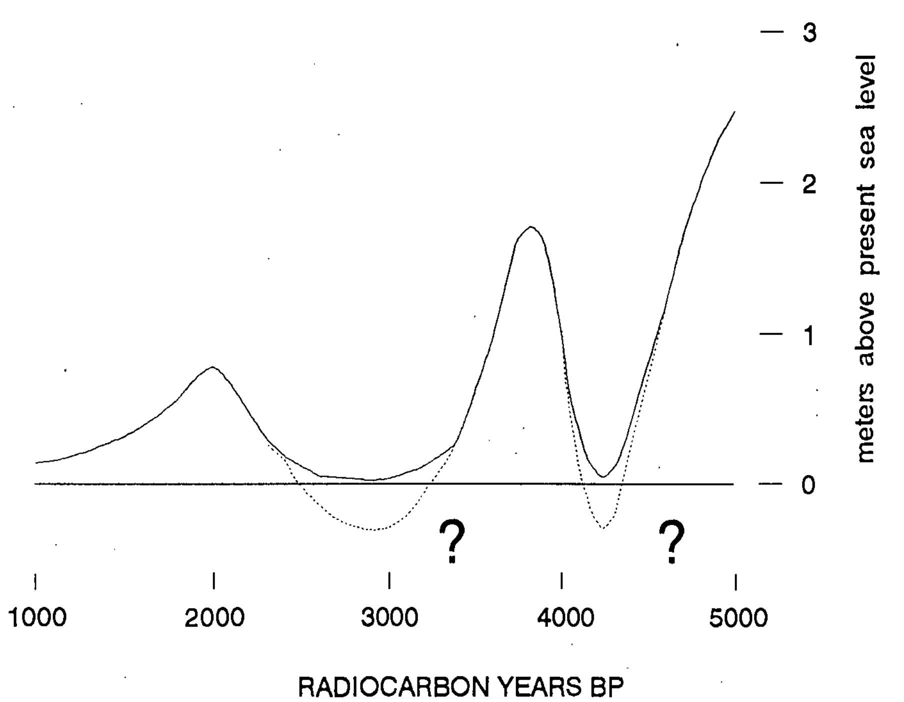

Figure 5.3b. Late-Holocene sea level curve for the western Cape coast according to Tortoise Cave evidence and previous palaeoshoreline research.

ii) Figure 5.2b and Table 5.4a show the marine sediment abundances in each layer at Tortoise Cave. There is an increase in the mean abundances of marine sediments from 4330 BP to 4020 BP. Subsequently, sometime between 4020 and 3520 BP (Layer 7) the mean abundance drops to values similar to those at the beginning of the sequence. From that time to *c.* 3100 BP mean abundances show a sustained increase to maximum values towards the end of this sub-sequence. After a hiatus of 1300 years, the mean abundances of marine sediments at Tortoise Cave are three times lower than in the previous layers. Abundances of marine sediments at Pancho's Kitchen Midden and Steenbokfontein Cave are highest between *c.* 3600 and *c.* 2900 BP and between 3500 BP and 4000 to 6100 BP, respectively (Tables 5.4b,c). Subsequently, mean abundance of marine sediments reach a minimum at about 2600-2200 BP and over the last 1000 years, as reflected by both records.

iii) Because the number of measurable *P. granatina* shells recovered from each layer was low, these stratigraphic units were regrouped for statistical purposes into entities termed strata. The groupings were determined according to the environmental picture presented in Figure 5.2a. The arrangement of the layers into strata is shown in Table 5.1: strata 2, 4 and 6 represent events of estuarine conditions at the Verlorenvlei mouth, whilst strata 1, 3 and 5 represent lagoonal and salt-marsh conditions. ANOVAs showed that the mean sizes of both species have increased and decreased significantly on several occasions from one stratum to the next ($p<0.05$) (Fig. 5.3a, Table 5.5). It is of particular significance that only between strata 5 and 6, and between strata 3 and 4, do significant increases in the mean sizes of *C. meridionalis* coincide with significant reductions in mean size of *P. granatina* (Fig. 5.3a).

Discussion and conclusions

The fact that *S. capensis* and *V. corrugata* abundances co-vary throughout the sequence is surprising and requires some discussion as *V. corrugata*, unlike *S. capensis*, is not an estuarine species. The preferred habitats of these two species would, however, have existed in the general vicinity of one another. The conditions of rock and sand interfaces characteristic of the protected Bay shores would have allowed *V. corrugata* to grow there in greater abundance than anywhere else in that area, whilst *S. capensis* would have been found only in the nearby river mouth in clean tidal sands (Kilburn & Rippey 1982). The common trends in abundance of these two species can therefore be explained by considering the behavioural response of people to the changing coastal environment to the river mouth. On the one hand, high abundances of *S.*

capensis are interpreted here as indicative of estuarine conditions prevailing at the river mouth due to a relatively high sea level. On the other hand, relatively high abundances of *V. corrugata* suggests enhanced shellfish collection in the vicinity of the Bay reefs and perhaps towards Baboon Point. These reefs would have been the only rocky shores that would have remained intertidal and available for fish collection in the entire Eland's Bay area during a high sea level stand.

The general trend of highest abundances of marine sediments in pre-2000 BP deposits with a subsequent decline as documented at Tortoise Cave, Pancho's Kitchen Midden and Steenbokfontein Cave (Table 5.4) has also been noted at Eland's Bay Cave (J. Parkington pers. comm.), Eland's Bay Open and Spring Cave (own data). These trends support the idea of a period of predominantly falling sea levels and high coastal sediment instability between 4330 and 3000 BP, and a subsequent period of sea level stabilization or recovery between 2600 and 760 BP. This interpretation finds support in Miller *et al.*'s (1993) report of a period of substantial aeolian sand transport and dune formation between 4000 and 3000 BP in the Eland's Bay area.

The interpretation of the common trends of *S. capensis* and *V. corrugata* discussed above finds support in the observations on the mean sizes of *C. meridionalis* and *P. granatina* in each stratum (Fig. 5.3a). Coincident but reverse changes in the respective mean sizes of these two species occur in precisely those strata which appear to represent changes in the condition of the Verlorenvlei mouth and preferred areas for shellfish gathering. During periods of high sea level (strata 6 and 4) most of the mussels and limpets were collected at the protected reefs of the Bay, close to Baboon Point, resulting in on average smaller mussels and larger limpets. Subsequently, during times of low sea level (strata 5 and 3), people gathered mostly at the newly exposed, and highly productive reefs of Mussel Point, which yielded larger mussels and smaller *P. granatina*. These productive reefs were thus intermittently exposed over time as sea level changed and prehistoric hunter-gatherers responded opportunistically to these events.

In sum, the archaeological evidence presented here in conjunction with the geoarchaeological observations obtained by Miller *et al.* (1993) suggest the following sea level history for the south western Cape over the last 6000 years (Fig. 5.3b). About 6000 BP sea level reached a maximum 2-3 m above present sea level. Subsequently, there was a rapid and relatively short timed regression around 4200 BP, to more or less present sea level. These events were followed by a transgression of an order of 2 m more than today at 4000 to 3800 BP. Later, sea level fell once again, reaching a minimum close to the present between 3500 to 2800 BP.

Table 5.7: Percentage frequencies of *C. meridionalis*, *Patella* spp, whelks and barnacles in Pancho's Kitchen Midden sequence. The category whelks include individuals from the genus *Nucella*, *Burnupena* and *Argobuccinum*.

C. meridionalis

LAYER	mean %	upper range	lower range
1	73.8	80.6	66.5
2	91.7	94.6	88.1
3	98.9	99.3	98.5
4	98.2	98.6	97.9
5	97.2	98.0	96.2
6	98.5	99.0	97.9
7	96.5	97.5	95.4

***Patella* spp** (present in some of the samples in layers 4, 5, 6)

LAYER	mean %	upper range	lower range
1	8.6	11.6	6.10
2	6.9	10.7	3.90
3	0.1	0.2	0.09
4	0.0	0.0	0.00
5	0.1	-	-
6	0.1	-	-
7	0.8	1.8	0.20

Whelks

LAYER	mean %	upper range	lower range
1	9.1	12.4	5.3
2	4.7	6.9	2.9
3	0.7	1.0	0.4
4	1.5	1.9	1.1
5	2.2	3.1	1.5
6	0.9	1.6	0.5
7	2.2	2.6	1.8

Barnacle

LAYER	mean %	upper range	lower range
1	8.10	11.00	5.50
2	2.30	2.80	1.80
3	0.17	0.22	0.13
4	0.17	0.25	0.10
5	0.45	0.63	0.30
6	0.40	0.51	0.28
7	0.32	0.47	0.20

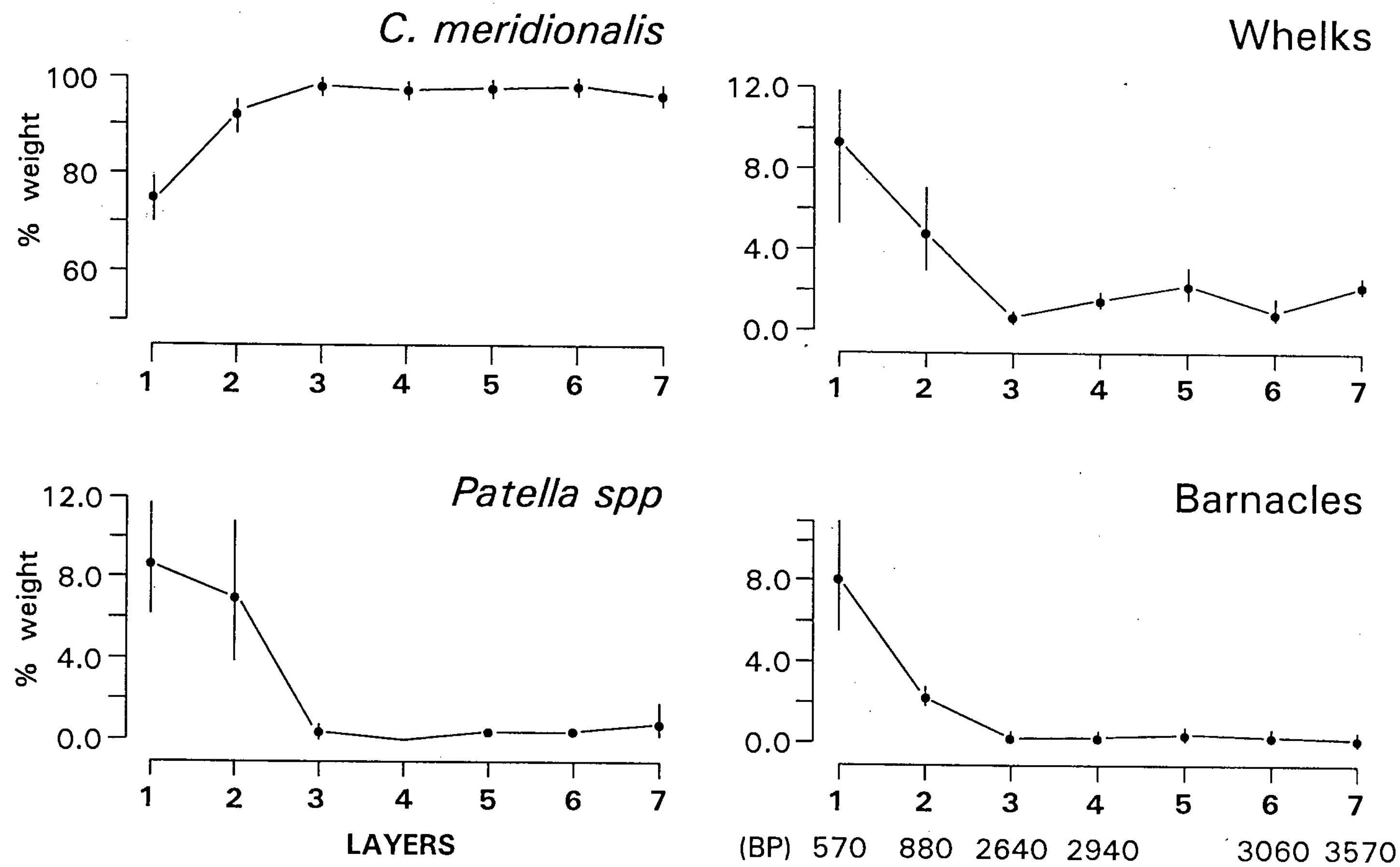

Figure 5.4. Mean percentages and standard deviation of the most frequent mollusc species in each layer of Pancho's Kitchen Midden. Note that the use of arcsin transformation results in unequal ranges above and below the calculated mean (Sokal & Rohlf 1981).

Some time around 2600 BP, sea level either stabilized or recovered, perhaps reaching a small, or short-lived, positive elevation relative to the present at about 1800 BP. Subsequently, sea level has remained stable at its present datum.

Similar fluctuating sea level curves for the last 6000 years have also been proposed for the south-east coast of southern Africa (Illenberger 1988; Illenberger & Verhagen 1990) and for all of the southern African coast (Cooper 1991), as well as for the Antarctic shores (Berkman 1992). Most importantly, both of the sea level regressions reported here coincided closely with two drops in sea surface temperatures (SST) and marked changes in weather conditions during Neoglacial episodes (Jerardino 1995b; see also Chapter 3). Sea level change due to ocean thermal expansion alone has not only been observed for short time scales (Peltier 1987), but has been predicted in models for longer climatic trends (Manabe & Stouffer 1993). Amongst other operating mechanisms (regional isostasy, tectonic uplifts and variations in the geoidal surface), steric effects triggered by cooler water were probably involved in the generation of negative sea level fluctuations in southern Africa during Neoglacial times (Jerardino 1995b). The relationship between minor sea level regressions and relatively cold SST can be explained in part by the addition of cold subantarctic waters into the Benguela Current by the Circumpolar Circulation (Chapter 3).

POSSIBLE IMPACT ON INTERTIDAL SPECIES:

In order to determine whether changes in SST, water turbidity and/or human predation could have affected the most frequently collected mollusc (*C. meridionalis*) at Pancho's Kitchen Midden (Fig. 4.1), a SST record was established, and a full analysis of the shellfish assemblage and marine sediments was undertaken with the excavated material of this particular site.

The nearest rocky reef is Mussel Point at a distance of 1.5 km from Pancho's Kitchen Midden. This exposed and low-angle reef is situated immediately in front of Mike Taylor's Midden (Figs 4.1: MTM; 4.15). It is likely that shellfish collection had mostly been undertaken at this reef, from the onset of its first occupation around 3500 BP until its abandonment around 600 BP, rather than elsewhere. By 3500 BP, sea level was probably low enough (see above; Fig. 5.3b) to have exposed the uppermost part of Mussel Point, making mussel beds at this locality easily accessible to people. Variations in sea level over the last 3 500 years could not have completely drowned the reefs at Mussel Point, thus making it unnecessary for hunter-gatherers to shift to other localities (such as Baboon Point and bay reefs) for the collection of intertidal shellfish (see above). The fact that Mussel Point is by far the nearest rocky reef to Pancho's Kitchen Midden, and that the shellfish assemblage of this site closely resembles the present reef shellfish composition, gives also support to the assumption that Mussel Point was the main locality for shellfish collection throughout the occupation of Pancho's Kitchen Midden.

As mentioned above in Chapter 3, current ecological studies have shown that *C. meridionalis* individuals would show generally smaller sizes than those growing under conditions relatively clean of inorganic sediments. Moreover, *C. meridionalis* seems to perform physiologically more efficient under conditions of relatively low temperatures (Griffiths 1981; Kilburn & Rippey 1982), which are the norm on the west coast. As also mentioned in Chapter 3, mean sizes of black mussels can also vary according to the degree of wave exposure. Nevertheless, this last consideration would only apply in case the preferred locality for shellfish collection (from Pancho's Kitchen Midden) would have shifted through time as a result of sea level fluctuations. As already discussed in the above paragraph, the inhabitants of Pancho's Kitchen Midden did not need to rely on shellfish colonies other than those located at Mussel Point. Consequently, for the purpose of the analysis of Pancho's Kitchen Midden shellfish assemblage, the influence of changes in wave exposure on black mussel mean sizes can be considered as fairly insubstantial.

Several shell bulk samples were obtained from each stratigraphic layer and from different squares during field work. Shell remains were sorted following the laboratory procedures employed for the analysis of Tortoise Cave mollusc assemblage (see above). The number of samples and total shell weight analysed from each stratigraphic layer fluctuated between 3 to 6 and from 18.4 to 60.8 kg, respectively (Table 5.6). Mean percentages and associated range were calculated by using the arcsin transformation (Sokal & Rohlf 1981). Size observations were obtained on *C. meridionalis* by measuring the prismatic band width (Buchanan 1985) of both left and right valves. Specimens with band widths equal or smaller than 4.5 mm were considered as sub-adults and quantified separately. For either left and right valves, no less than 685 measurements were obtained for each stratigraphic layer. For the purposes of testing statistical significance for possible changes in the mean sizes of black mussels, a model of analysis of variance (ANOVA) was used (Sokal & Rohlf 1981), and was conducted with the Statistical Analysis System package (SAS 1985).

The relative measure of the palaeo-turbidity of littoral waters was established by quantifying marine sediments present in each stratigraphic layer of Pancho's Kitchen Midden and

Table 5.8: Frequency of species from the genus *Patella* in each analysed sample from Pancho's Kitchen Midden.

	nr. of shells	*P. granatina*	*P. granularis*	*P. barbara*	*P. argenvillei*	*P. miniata*
Layer 1						
	48	45.8	25.0	27.1	2.0	0.0
	66	42.4	45.4	1.2	0.0	0.0
	102	74.5	13.7	8.8	2.0	1.0
	133	56.4	33.8	7.5	2.2	0.0
	265	72.1	23.4	3.8	0.0	0.7
Layer 2						
	14	7.1	92.9	0.0	0.0	0.0
	16	43.8	56.2	0.0	0.0	0.0
	38	27.0	72.9	0.0	0.0	0.0
Layer 3						
	1	0.0	100.0	0.0	0.0	0.0
	1	0.0	100.0	0.0	0.0	0.0
	2	100.0	0.0	0.0	0.0	0.0
	5	80.0	20.0	0.0	0.0	0.0
Layer 4						
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
Layer 5						
	0	0.0	0.0	0.0	0.0	0.0
	2	100.0	0.0	0.0	0.0	0.0
	2	50.0	50.0	0.0	0.0	0.0
Layer 6						
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
	0	0.0	0.0	0.0	0.0	0.0
	1	100.0	0.0	0.0	0.0	0.0
	2	50.0	50.0	0.0	0.0	0.0
	3	25.0	75.0	0.0	0.0	0.0
Layer 7						
	0	0.0	0.0	0.0	0.0	0.0
	3	66.6	33.3	0.0	0.0	0.0
	9	44.4	55.6	0.0	0.0	0.0
	18	72.2	27.8	0.0	0.0	0.0
	23	52.1	47.9	0.0	0.0	0.0

Table 5.9: Summary statistics of *C. meridionalis* prismatic band in each layer of Pancho's Kitchen Midden.

LEFT VALVE

LAYER	n	mean (mm)	std	95% conf. interv.
1	955	9.6	1.3	0.08
2	469	8.2	1.2	0.10
3	774	8.7	1.4	0.10
4	895	8.1	1.1	0.08
5	685	7.8	1.4	0.10
6	1786	8.4	1.5	0.06
7	633	9.0	1.5	0.11

RIGHT VALVE

LAYER	n	mean (mm)	std	95% conf. interv.
1	845	9.5	1.3	0.08
2	836	8.1	1.1	0.10
3	907	8.6	1.4	0.10
4	928	8.1	1.2	0.08
5	793	7.8	1.4	0.10
6	1745	8.4	1.4	0.06
7	715	9.0	1.4	0.10

Table 5.10: Summary statistics of *C. meridionalis* sub-adults abundance expressed as number of individuals (MNI) per 1000 adult *C. meridionalis*; abundance of marine sediments expressed as grams per kilogram of *C. meridionalis*; and oxygen isotope values obtained from *P. granatina* shells in each layer. For data regarding isotope values of individual *P. granatina* shells see Appendix 1.

LAYER	sub-adults mean $\pm$ std	marine sediments mean $\pm$ std	isotope values $\delta^{18}O$ (pdb $^{o}/oo$)
1	37.0 $\pm$ 11.6	0.5 $\pm$ 0.03	1.49 $\pm$ 0.12
2	35.8 $\pm$ 7.5	1.3 $\pm$ 0.10	1.52 $\pm$ 0.21
3	66.4 $\pm$ 3.6	1.5 $\pm$ 1.10	1.56 $\pm$ 0.09
4	96.5 $\pm$ 28.3	2.2 $\pm$ 0.20	1.28
5	202.0 $\pm$ 40.5	3.1 $\pm$ 0.10	1.25 $\pm$ 0.10
6	65.0 $\pm$ 16.4	1.1 $\pm$ 0.20	1.46 $\pm$ 0.12
7	122.4 $\pm$ 18.2	2.3 $\pm$ 0.20	1.28 $\pm$ 0.16

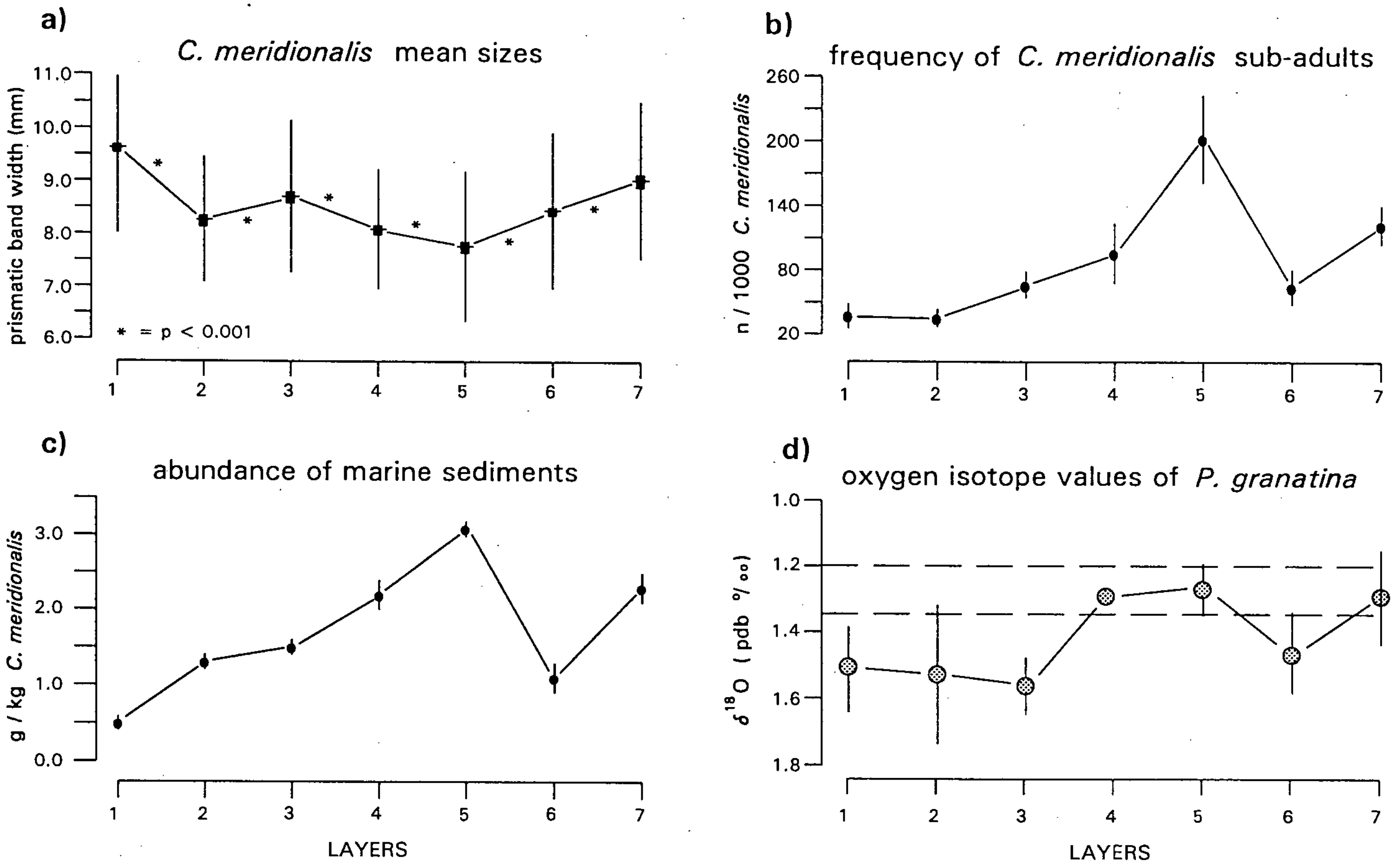

Figure 5.5. Palaeoecological observations on Pancho's Kitchen Midden sequence: a) C. meridionalis prismatic band mean sizes, b) frequency of C. meridionalis sub-adults, c) abundance of marine sediments, d) results obtained from oxygen isotope analyses undertaken with P. granatina shells. Modern range is indicated by dashed lines.

retained by a 1 mm mesh during excavations (Jerardino 1993). It was assumed that shellfish collection had mostly been undertaken at the reef of Mussel Point rather than elsewhere, as extensive mussel beds are of easy access in this locality during low tides. The fact that this reef is by far the nearest to Pancho's Kitchen Midden, and that the shellfish assemblage of this site closely resembles the present reef shellfish composition supports this assumption.

Average paleo-SST were established by analyzing *P. granatina* shells of each stratigraphic layer via oxygen isotope analysis following Cohen's (1993) laboratory procedures and shell size requirements. Observations on late-Holocene SST previously obtained by Cohen (1993) were not used in this study. This is mostly due to the fact that strict contemporaneity of Cohen's data with the high resolution record of Pancho's Kitchen Midden sequence is doubtful. Because of this reason, possible short-timed SST fluctuations that might be observable from Pancho's Kitchen Midden are not likely to be reflected by previous observations.

Results

Mean frequencies (%) and associated ranges of the most frequent groups of mollusc species are shown in Table 5.7 and represented in Figure 5.4. Clearly, *C. meridionalis* is the dominant species throughout Pancho's Kitchen Midden occupation, with frequencies ranging between 92% to nearly 99% from Layer 7 to Layer 2 (3600 to *c.* 900 BP). In Layers 1 and 2, black mussel frequencies show a moderate drop to 74% and 91%, respectively. Whelks (*Nucella* spp, *Burnupena* spp and *Argobuccinum pustulosum*), and four species of the genus *Patella*, as well as barnacle remains increase in frequency in the two topmost layers, but without dominating the shellfish assemblage. Details of the frequency of species from the genus *Patella* present at Pancho's Kitchen Midden is provided in Table 5.8.

Mean sizes of both left and right valves' prismatic bands show the same pattern of change (Table 5.9). Figure 5.5a shows mean width, 95% confidence intervals and standard deviations of *C. meridionalis* prismatic bands from left valves for each stratigraphic layer. ANOVA results show that the mean sizes of black mussels increased and/or decreased significantly from one layer to the next ($p<0.001$).

Table 5.10 and Figure 5.5b show the mean abundance of *C. meridionalis* sub-adults. Relatively high frequencies of sub-adults were present at the onset of Pancho's Kitchen Midden occupation (Layer 7). Before reaching highest frequencies in Layer 5, frequencies dropped markedly in Layer 6. In subsequent occupations, sub-adult mean abundances drop steadily from Layer 4 to Layer 1.

Table 5.4b and Figure 5.5c show the mean abundances of marine sediments at Pancho's Kitchen Midden expressed as grams per kilogram of black mussel shell. The general pattern of change of relatively high mean abundances before 2900 BP and low abundances in the last 2600 years resembles closely other archaeological sequences in the study area (J. Parkington pers. comm; Fig. 5.2b, Tables 5.4a,c). This extremely well resolved sequence also shows a brief period of low water turbidity at 3060 BP, interrupting a general trend of high water turbidity between *c.* 3600 BP and 2900 BP.

Table 5.10 and Figure 5.5d show the oxygen isotope values on *P. granatina* for each stratigraphic layer. Enriched isotope values were recorded for Layers 1, 2, 3 and 6. The scale of change involved during these episodes (around 600, 990, 2600 and 3100 BP, respectively) consisted of negative temperature departures of at least 1 °C relative to the present average SST.

Discussion and conclusions

Besides barnacles, most of the species that show an increase in their frequencies in Layers 1 and 2 are of easy access within the mid and low intertidal zones (Kilburn & Rippey 1982), particularly at the flat reefs of Mussel Point. Large barnacles (*A. cylindricus*), in contrast are found in subtidal waters. Some of the analyzed barnacles were attatched to other species, often to black mussels and *P. barbara* to some extent. The majority of the specimens, however, were found detached from other shell. In these cases, marks of mussel growth rings are shown in their bases, which constitutes a clear proof of barnacles having grown on a mussel shell before their collection.

The increase in barnacle frequencies has also been observed for other caves and shelters in the Eland's Bay area within the last 1200 years (Parkington & Jerardino data). Their presence in the archaeological record might indicate changing practices of shellfish collection towards low-intertidal and subtidal zones in the last 1200 years, and/or the collection of washed up low-intertidal individuals after stormy weather. It is also possible that barnacles could have became a more common species at the rocky reefs as a consequence of palaeoceanographic changes. It is important to note, that the shellfish composition of the nearest megamidden located just onshore of Mussel Point (Fig. 4.12: MTM), dating to between 3000 and 2000 BP, show frequencies of barnacles (around 10%) comparable to those quantified for Layers 1 and 2 at Pancho's Kitchen

Midden (own data). Thus, the almost complete absence of barnacles in Layers 3 to 7 at Pancho's Kitchen Midden might reflect a different set of transport decisions from the place of collection to this campsite before 1200 BP, rather than changes in the zone of shellfish collection. Barnacles were probably removed from the surface of the collected mussels before carrying them to a campsite located in the range of one or more kilometres away from the shoreline.

Nevertheless, barnacles seem to have become markedly more common in the shellfish collections after 1200 BP, as evidenced by the shellfish assemblage of Mike Taylor's Midden dating to 980 BP (Chapter 4, own data). Moreover, shellfish collections undertaken from Pancho's Kitchen Midden around 600 BP (Layer 1) did include slightly more low-intertidal and high subtidal limpet species (Table 5.8) than previously. Consequently, it seems reasonable to conclude that shellfish gathering was generally undertaken within the mid and low intertidal zones throughout Pancho's Kitchen Midden occupation, with slightly more generalised collections involving the upper subtidal in the last 600 years.

Results on SST show that any expected correlation of relatively large sizes of black mussels with relatively cold SST is not confirmed. *C. meridionalis* mean sizes were largest at *c.* 3600 BP and again at *c.* 600 BP, but clearly different SST values were obtained from both of these samples. Similar inconsistencies are encountered with the smallest mean sizes, expected to be associated with relative warmer SST. As Figures 5.5a, d show, the smallest *C. meridionalis* mean sizes are recorded in Layers 2 and 5, both of which are associated with relatively colder and present average SST, respectively.

When comparing the marine sediment sequence against the black mussel mean sizes sequence, there seems to be a clear inverse relationship, except for Layer 7 (*c.* 3600 BP) and Layer 2 (*c.* 900 BP). As expected, large black mussel mean sizes correlate with low levels of water turbidity, and *vice versa*. The lack of covariance between marine sediment abundances and black mussel mean sizes for Layer 7 and 2 is not explained by changes in SST as noted above.

Mean abundances of *C. meridionalis* sub-adults covary very closely with changes in marine sediment abundances. Not only highest marine sediment abundances are accompanied by highest frequencies of *C. meridionalis* sub-adults and *vice versa*. The direction of change from one layer to the next for both of these variables is almost identical. These results confirm the expectations of high abundances of *C. meridionalis* sub-adults during periods of relatively high water turbidity, as a consequence of decreased growth rates due to greater investment of energy in the feeding process of this species (see Chapter 3).

From the results presented here, it is clear that the relative turbidity of intertidal waters has affected the growth rate of *C. meridionalis* significantly. Although water turbidity may explain part (and perhaps most) of the variability in the black mussel mean sizes of this particular sequence, it does not explain everything (Layers 7 and 2). It is also evident that changes in SST of the magnitude recorded here have had no effect on the mean sizes of black mussels. Nevertheless, these conclusions do not exclude the possibility of other intervening factors, such as variations in the intensity of human shellfish exploitation, in the generation of changes in the mean sizes of black mussels (Hockey & Bosman 1986; Durán *et al.* 1987; Jerardino *et al.* 1992) for particular time slices of Pancho's Kitchen Midden sequence.

A rapid accumulation of shell refuse took place at Pancho's Kitchen Midden around 2900 - 3100 BP. Nearly half of the deposits at this site dates to this short time span (Chapter 4: Fig. 4.5). Hence, visits during this time to this place must have involved a significant increase in shellfish exploitation. It is precisely during this period when two consecutive drops in mean sizes of black mussels are observed in Layers 6 and 5 (Fig. 5.5a). Black mussel mean sizes in Layer 6 show a decrease compared to Layer 7 despite the marked drop in water turbidity. The intensity of black mussel exploitation was probably very high during Layer 6 deposition. It is also likely that lowest mean sizes of black mussels in Layer 5 were a combined result of both highest water turbidity and intense shellfish exploitation. Subsequently, mean sizes of black mussels increased significantly from Layer 5 to Layers 4 and 3. These results are somewhat surprising since the dates of both these Layers are close to the earliest date obtained for the megamidden of Mike Tayolor's Midden, a site showing clear evidence of large scale shellfish collection (Chapter 4) at Mussel Point. Consequently, the observed recovery of the mean sizes of black mussels in Layers 4 and 3 can either be the result of an extended intertidal at Mussel Point due to lowering sea levels (see below), and/or because of an increase in black mussel productivity due to an unusually rich supply of marine nutrients on the west coast after 2900 BP (Chapter 3). It is important to note, that the markedly low SST recorded for the southern Benguela between 2900 and 2500 BP (see Chapter 3: Cohen *et al.* 1992; Cohen 1993) might have involved enhanced upwelling events around the study area. In such circumstances, a rich supply of nutrients would frequently have been available to shellfish colonies, favoring the biological productivity of the intertidal zone. Hence, the possibilities for over-exploitation of black mussels and other marine resources would have been very slim during this period.

Water turbidity was relatively low, sea surface temperatures were colder than at present (Figs. 5.5c, d), and very few small sites were occupied in the vicinity of Mussel Point reef *c.* 900 BP. Despite these favourable circumstances for the recovery of shellfish sizes, mean sizes of black mussels were relatively small at this time. No satisfactory explanation for this particular set of data can be suggested at the moment. These apparent contradictions can only be resolved with further research involving similar case studies. Finally, mean sizes of black mussels in Layer 1 were the highest in Pancho's Kitchen Midden sequence. In this case, lowest water turbidity and relatively cold SSTs, as well as limited shellfish collection in low intertidal and margins of subtidal reefs seem to be the most important factors behind this observation.

IMPLICATIONS:

Although never clearly and explicitly stated, ecological deterministic explanations were suggested for the massive increase in shellfish exploitation during the megamidden period. Megamiddens are frequently, but not invariably, located immediately onshore of highly productive rocky reefs (Figs 4.1, 4.2). Partly because of this last observation and due to initial palaeo-sea level research (Yates *et al.* 1986), the appearance of megamiddens was in the past, explained as people's behavioural response to changes in sea level (Yates *et al.* 1986; Buchanan 1988; Parkington *et al.* 1988). It was suggested that, after 3000 BP, sea level dropped from a mid-Holocene high and extensive rock platforms were exposed intertidally, making available to humans their enormous food potential. According to this scenario, this offer must have been so irresistible to hunter-gatherers that it prompted them to change their settlement and subsistence systems radically. The appearance of a highly predictable, productive and extremely easy to collect resource, ready to be exploited during low tides, was enough to have completely and radically re-organized hunter-gatherer life at the coast.

This reconstruction, however, seems rather too simplistic. If sea level was one of the most important forces behind these marked changes in subsistence, then these changes and their advantages should have been clearly evident to hunter-gatherers. The difference between carrying on with the previous life style and adopting a new one, and the weight of the related social and cultural aspects challenged in this change, must have been pivotal in a series of decisions regarding the possibility of a new settlement and subsistence strategy. At best, the perception of sea level change would not have been perceived by more than three generations belonging to the same social unit, as these are probably the maximum number of coexisting generations within hunter-gatherer groups. Following an ecologically deterministic line of thought, one would also expect that at the time of maximum natural offer (greatest access to intertidal reef), maximum (or nearly so) profit would have been made. Moreover, each time this type of offer was made by the environment, people had to react in the same way, qualitatively and quantitatively, unless other mediating factors in hunter-gatherer life were also operating.

According to sea level reconstructions presented in this Chapter and elsewhere (Miller *et al.* 1993), if sea level dropped from approximately 2 m high to its present mark between 4000 and 3000 BP, the rate of sea level regression would have been 2 cm every 10 years. Three co-existing generations of hunter-gatherers would represent approximately 75 years of human life. During this period sea level would have dropped nearly 15 cm. It may be possible that such a change in sea level would have been perceived with the help of recalling memories (grandparents to grandchildren), and from subtle differences in the littoral landscape (e.g. changes in the size of wash-over lagoons). However, it is unlikely that 15 cm would have been perceived as a change in the intertidal landscape. In case this would have been indeed the case, it is difficult to believe that such small change would have provided the necessary incentive for the build up of the megamiddens.

Shellfish collection from Tortoise Cave was indeed relatively more emphasized between 4000 and 3100 BP than previously (Jerardino 1995a; Chapter 6) as evidenced by the accumulation of the large talus at this site (Chapter 4). It could then be argued that this behaviour might have been related to greater shellfish availability due to contemporary falling sea levels (Fig. 5.3b). Nevertheless, although sea level was clearly falling from a ± 2 m high point at 4000 BP, many of the flat reefs at the Bay and Mussel Point were drowned by 1 m of sea water between 4000 and around 3400 BP (Fig. 5.3b). Consequently, only a portion of the reefs presently exposed in the Eland's Bay area would have been accessible for shellfish gathering during this period. This particular increase in the exploitation of shellfish between 4000 and 3100 BP seems to have responded mainly to greater food demands by larger visiting groups engaged in relatively longer visits at Tortoise Cave (Jerardino 1995a; Chapter 6), rather than to a relative drop in sea level. It is also important to note that the observed increase in shellfish collection, as reflected at this site, was not accompanied by the accumulation of megamidden deposits, all of which date within the following millennium (Chapter 1 and 4).

The period between 2600 to 2400 BP shows the highest deposition rates during the megamidden period: it is represented in most megamiddens, and spatially, shell accumulations dating to these two centuries extend over larger areas than younger and older ones (Chapter 4). According to the paleo-sea level reconstruction presented here (Figure 5.3b), sea level was either as it is today or transgressing once again by that time. When allowing for an environmentally deterministic argument, maximum levels of exploitation should be expected to have been reached before 2600 BP, when sea level was at its lowest (sometime between 3500 and 2800 BP). Nevertheless, the evidence available at present clearly shows that this was not the case.

It is also important to add, that during the first regression, *c.* 4200 BP, a comparable areal extension of productive shoreline to the second regression, would have been available to hunter-gatherer groups. And although the rate of sea level regression was much higher just before 4200 BP (23 cm drop of sea level in 75 years), this phenomenon did not lead to a large scale exploitation of shellfish as it did during the megamidden period. Clearly, factor(s) other than sea level change alone were involved in shaping a new settlement and subsistence choice during the megamidden period.

For some reason, the accumulation of megamiddens started around 3000 BP. This phenomenon did not happen around 4200 BP during the first sea level regression, nor after 2000 BP, when sea level remained at its present level. But it is also possible that this was indeed the case because sea level reached a mark below the present level sometime during the megamidden period (Fig. 5.3b: dotted line). A combination of this and a flat rocky shore topography could have created larger areas of productive and accessible intertidal reef than today. Unfortunately, relevant data for the purpose of testing this possibility, such as highly detailed intertidal and subtidal profiles in addition to dated sea level marks below the present datum, are not yet available.

Finally, it might also be suggested that the tide range during the megamidden period could have been greater, allowing people greater access to intertidal and lower subtidal environments. Indeed, palaeotides studies have shown that significant changes in the amplitude of tides often take place when water depth is reduced (Devoy 1987). These changes, however, involve a reduction in tidal range, which is associated with sea level regressions of a magnitude considerably greater (5 to 20 m) than the sea level regressions reported here. Consequently, it seems likely that differences between high and lower water marks remained more or less constant throughout the late-Holocene at the south western Cape.

Black mussels were the most common shellfish species collected during the megamidden period. According to the evidence obtained from Pancho's Kitchen Midden, this resource showed signs of having been over-exploited at the beginning of this period (3000-2900 BP), but not subsequently. Mussel colonies showed a recovery in their mean sizes once levels of water turbidity had declined. However, shellfishing must have increased subsequently, as the number of nearby megamidden occupations also increased (Chapters 1 and 4). Nevertheless, according to the evidence presented here and elsewhere (Jerardino & Yates unpublished data) mussels show no clear evidence of having been overexploited during the "peak" time of megamidden accumulation, dated to between 2600 and 2400 BP. Such a set of observations can only make sense in the context of favourable palaeoceanic conditions conducive to enhanced biological productivity (e.g. upwelling) of this resource (Chapter 3), and/or an increase in the area of rocky intertidal.

In sum, sea level change seems not to have been a factor of primary importance giving rise to the marked changes in settlement and subsistence experienced during the megamidden period. Instead, it is suggested that reasons behind these shifts should be also sought and discussed beyond a purely ecological arena by asking questions about the relevant social and economic aspects of hunter-gatherer life that must have organized peoples' lives before, during and after the megamidden period. An attempt towards this line of enquiry constitutes the objective of the following chapters.

CHAPTER 6

CHANGES IN REGIONAL SETTLEMENT PATTERNS AND SITE USAGE

INTRODUCTION:

As seen in Chapter 4, an impressive number of radiocarbon dates has recently been obtained for many sites in the research area, particularly over the last couple of years. This improved chronological control on prehistoric settlement choices in the research area is useful not only for updating observations on precolonial settlement patterns across time and space (Parkington *et al.* 1986; Buchanan 1988; Yates 1989), but can also allow for new insights into aspects of site usage at an intra-site level. This second approach is needed because it can answer questions regarding settlement changes that a regional perspective cannot help to solve. Intensity of site occupation, changes in the size of the visiting groups and relative duration of their visits, as well as shifts in the relative frequency of visits to sites, are all variables that archaeologists can only venture to sketch by careful examination of individual site formation processes. Thus, the zonal (or geographical) perspective and the intra-site approach adopted here are complementary tools for unravelling two aspects or dimensions of the same phenomenon, that is, the use of the landscape by coastal hunter-gatherers. Ultimately, the aim behind studying these aspects of human settlement is to relate them to each other and to identify the factors or *determinants* behind these changing choices, which can be socio-cultural, ecological, economical or technological, amongst others (Trigger 1968). The identification of such determinants must be supplemented by observations resulting from the analyses of food residues and artefactual remains in order to offer a more complete picture of past human behaviour.

The aim of this chapter is to present updated observations on changes in the choice of sites visited and concomitant variations in the geographical distribution of human settlement in the research area through time. These observations are also correlated with the reconstruction of site formation processes at Tortoise Cave, Pancho's Kitchen Midden, Steenbokfontein Cave and several megamiddens. For a better understanding of the emerging patterns, observations regarding site usage are based in part on the quantification of deposition rates of artefacts and food remains, as well as quantities of fauna brought into sites by agents other than people. In this respect, a few observations on material culture and subsistence are advanced in this chapter

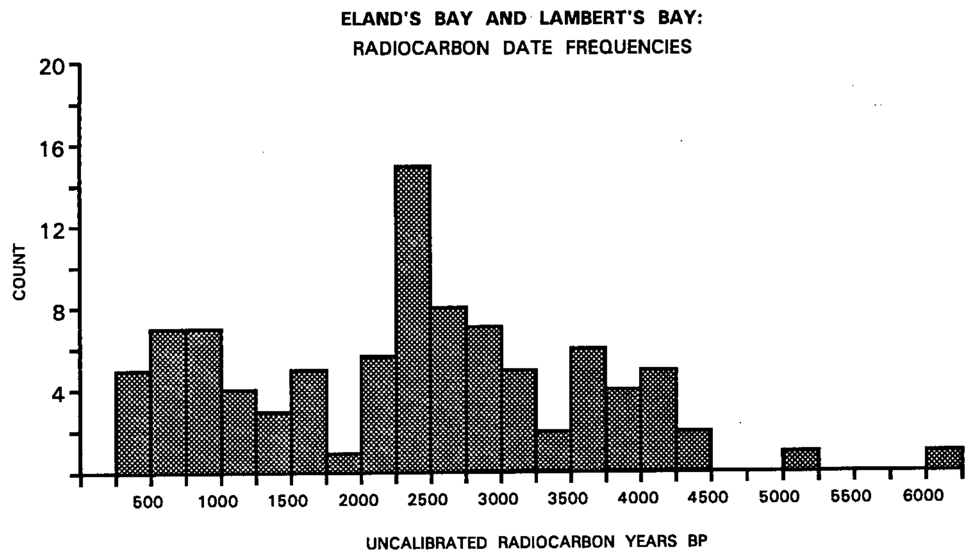

Figure 6.1: Radiocarbon date frequencies for the Lambert's Bay and and Eland's Bay areas.

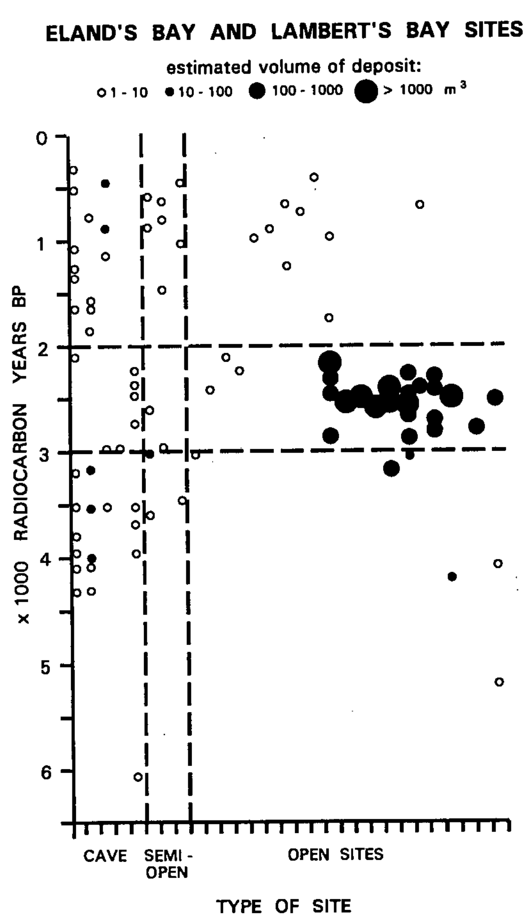

Figure 6.2: Changes in settlement patterns in the Lambert's Bay and the Eland's Bay areas.

before they are described and discussed at length in Chapter 7 and 8. Additional and important observations on hunter-gatherer settlement changes are also presented in the following chapters, as these provide test cases for the reconstruction derived from the results presented in this chapter.

SETTLEMENT PATTERNS AT A REGIONAL SCALE:

The basic sequence of very infrequent visits to the research area during the mid-Holocene and recurrent occupation of sites over the last 4500 years (Figs 6.1 and 6.2) has remained the same since its first description (Parkington *et al.* 1986, 1988; Parkington 1987a; Buchanan 1988) until today. The three-phase description consisting of marked changes in settlement resulting from an initial re-occupation, followed up by the build up of megamiddens and subsequent arrival of pastoralism in the western Cape, partly reflected research designs, and also partly the constraints posed by a relatively modest number of radiocarbon dates available at that time. Since then, many more radiocarbon dates have been obtained, now allowing for a better chronological resolution of the same trajectory of settlement choices (Fig. 6.2).

Observations on dated occupations

The number of sites dating to between 4500 and 3000 years BP has increased from three initially reported (Eland's Bay Cave, Tortoise Cave and Spring Cave; Fig. 4.1) to a total of eight. The new additions consist of occupations at Steenbokfontein Cave, Pancho's Kitchen Midden, Scorpion Shelter, Malkopan and Doorspring (Figs. 4.1 and 4.2). Clearly, this 1500 year long period can no longer be characterized by visits to cave sites only and, perhaps, deflation hollows as suggested previously. With the exception of Steenbokfontein Cave, two of the sites recently found to contain deposits dating to between 4500 and 3000 BP consist of rock shelters (or semi-open sites) with a substantial proportion of their deposits represented by open talus accumulations, and two open sites situated close to the shoreline. Thus, a range of different types of sites were visited during this period.

The modest peak in the number of radiocarbon dates around 3500 BP (Fig. 6.1) is not only a reflection of an increase in the frequency of visits to the research area at that time. At least three sites (Spring Cave, Pancho's Kitchen Midden and Scorpion Shelter) were also opened to human occupation for the first time between 3600 and 3400 BP (Table 4.1; Fig. 6.2). The access to one of them (Spring Cave) involves a steep walk up to 100 meters a.m.s.l on the southern bank of Verlorenvlei (Fig. 4.1). The locations of these and other sites dating to between 4500 and 3000 BP, are all within a distance of 5 km from the shoreline. One of them (Fig. 4.1: Scorpion Shelter) is located nearly 8 km away from the nearest present rocky intertidal reef and approximately 4 km away from the nearest sandy beach (Wahl 1994). This suggests that relatively long distance movements were involved in the collection of shellfish from this site, as sandy shore species were gathered only very occasionally in the Eland's Bay area (Buchanan 1988). Visits seem to have been less frequent immediately after 3500 BP, but became more regular again after 3250 BP (Fig. 6.1). Overall, volumes of occupational refuse dating to between 4500 and 3000 BP seem to consist of a few cubic meters at each site, with the single exception of Tortoise Cave where volumes of archaeological deposits are one order of magnitude larger than in the rest of the sites (Fig. 6.2).

At the beginning of the 3000 to 2000 BP millennium a variety of sites were inhabited, and the resulting accumulation of archaeological deposits at these sites ranges from a few cubic meters to nearly a thousand cubic meters. At this time (2900 - 3000 BP), occupation of large caves (Eagle Cave and Spring Cave), rock shelters (Pancho's Kitchen Midden and Eland's Bay Open), small open sites (Soutkloof 1) and some of the megamiddens (Grootrif D) was more or less contemporary (Fig. 6.2). Megamidden accumulation started about this time, or perhaps slightly earlier, around 3100 BP, as attested by Kreefbaai C midden (Table 4.2). As it is apparent in Figures 4.1, 4.2 and 4.17, the choice for a place in the landscape was restricted to sites within a distance of 1.5 km from the shoreline. This set of observations was unnoticed in previous published work, mostly because of lack of data.

Immediately after 2900 BP, settlement shifted almost exclusively behind and along stretches of rocky shoreline, where hundreds or thousands of cubic meters of archaeological deposit (megamiddens) accumulated at each location over nearly a thousand years (Figs 4.1, 4.2 and 4.12). These changes in location and deposition rates were the main and only characteristics attributed initially to the settlement pattern of the megamidden period (Parkington 1987a: 11; Buchanan 1988: 74). Nevertheless, several exceptions to this "solid" pattern have emerged (Fig. 6.2) as a result of the survey and excavation programmes developed for this thesis project.

The first two such exceptions consist of dated evidence for repeated visits to Steenbokfontein Cave between 2700 and 2200 BP and for a relatively short period of occupation around 2600 BP at the rock shelter of Pancho's Kitchen Midden. It is important to note that it is precisely between 2700 and 2200 BP when most of the megamiddens were also visited. These observations support the suggestion that this 500 year long period witnessed the most intense human occupation of the coastal fringe during precolonial times (Figs 6.1 and 6.2).

Additional deviations from the earlier proposed settlement pattern for the megamidden period consist of a number of sites situated along a dune cordon approximately 10 km south of Mussel Point (Fig. 4.17). Most of these sites are probably the reflection of ephemeral occupations, as shown by the thin surface deposits spread over an area of no more than 1000 m^2 in each case. Only four out of a total of forty-two recorded sites on the dune cordon have been dated (Table 4.2). It would not be unreasonable to expect that at least half of them (21) date to the megamidden period, in which case most would probably cluster temporally in the second half of the 3000 to 2000 BP millennium. The evidence at hand, however, shows that the frequency of radiocarbon dates drops by just over half towards the end of the megamidden period.

The number of sites and the associated volumes of archaeological material change dramatically after 2000 years BP, most probably as a consequence of the arrival of the pastoralist economy in the western Cape (Parkington *et al.* 1986, 1988; Webley 1992; Sealy & Yates 1994). This sharp contrast in settlement preferences is shown at its most extreme by the low number of occupations dating to immediately after 2000 BP and the relatively larger number of sites at the end of the megamidden period (Fig. 6.1). The frequency of radiocarbon dates subsequently increases again, showing another period of relatively frequent visits to the study area between 1000 and 250 years ago. Nevertheless, the magnitude of the deposits built up during the megamidden period was not seen on the coastal landscape ever again. Visits to the chosen sites in the last two millennia left only a few cubic meters behind, with the exception of Spring Cave, where the total estimated deposits dating to the last 1200 years easily exceeds the mark of ten cubic meters (Fig. 6.2).

Discussion and implications

The interpretation of uncalibrated radiocarbon histograms (Fig. 6.1), however, is not without problems. Clustering of radiocarbon dates may occur in certain time intervals due to pronounced distortions in the near linear relationship between radiocarbon time scale and calendrical scale (Stolk *et al.* 1994). Three time intervals have been identified for the last 4500 radiocarbon years (Stuiver & Becker 1993; Stuiver & Pearson 1993; Pearson & Stuiver 1993) where the difference between a radiocarbon date and its calendrical equivalent could be equal to or more than a hundred years. These time intervals have been named "ambiguous regions"

(McFadgen *et al.* 1994), and are associated with radiocarbon ages of 2200, 2500 and 4150 BP in the radiocarbon calibration curve. Consequently, it is possible that the prominent peak in the frequencies of radiocarbon dates between 2250 and 2500 BP shown in Figure 6.1 is partly the result of pronounced variations in the natural production of atmospheric ^{14}C in the past. Nevertheless, whatever the "real" ages represent those radiocarbon dates clustering artificially around that period, their probable radiocarbon age must date to either one or two centuries before or after 2500 BP. Hence, the real frequency peak during the megamidden period should be read as between 2750 and 2000 years BP. The ages of two other modest frequency peaks around 3500 BP and also between 1000 and 500 years BP (Fig. 6.1) are associated with only minor "ambiguous regions" (Stuiver & Becker 1993; Stuiver & Pearson 1993; Pearson & Stuiver 1993) when compared to the ones referred to above. Therefore, both of these peaks can be considered as an approximate reflection of relatively more frequent visits to the study area around 3500 BP and between 1000 and 500 years BP.

Sampling biases are another aspect to consider before the results expressed in Figures 6.1 and 6.2 are interpreted. Rises in sea-levels in the order of 20 m are, certainly, important factors to consider in the reconstruction of coastal settlement patterns spanning glacial to interglacial periods (Parkington 1981; Van Andel 1989), because of their destructive effect on archaeological sites. Thus, it is also possible that some of the coastal shell middens located very close to past shorelines might have been eroded or washed away by subsequent high sea level stands of 2 to 3 meters, which took place around 7500 to 4500 BP and again between 4000 and 3600 BP (Chapter 3). But this scenario does not seem to have been the case. Doorspring midden (Fig. 4.2) is located only 50 meters away from the present high water mark (Kaplan 1994), and contains occupational debris dating to before the last high sea level stand around 4000 BP (Table 4.1). The site of Malkopan (Fig. 4.2; Table 4.1) constitutes another and very similar example. Consequently, the apparent absence of open shell middens pre-dating 4000 BP seems rather the reflection of a choice for places predominantly away from the shore or not immediately next to it. It is also possible that a few open shell middens dating to before 4000 BP still remain undetected by archaeologists as they lie below dune sand material.

Another methodological problem in the interpretation of radiocarbon frequency histograms is posed by the fact that shell middens are more bulky, and thus more visible to archaeologists than any other type of site, such as stone scatters (Bird & Frankel 1991). Because of these reasons, shell middens might receive considerable more attention than other types of sites in research programs, which can result in the exaggeration of their contribution to the overall settlement pattern in a given area. Nevertheless, these considerations are less of a problem in our case. A great proportion of sites encountered and recorded over the last twenty years of field survey within the study area bear shell deposits (SARU data base). Moreover, undated stone scatters (deflation hollows) have been the subject of a special study (Manhire 1984, 1987) and their approximate age has been recently reassessed (see below). Furthermore, the analysis of intra-site settlement patterns based on deposition rates (see the following section and Jerardino 1995a) also allows for an assessment of the changes in the relative abundances of material other than shell.

The survey, excavation and dating programmes developed for this thesis project were designed, in part, to correct the apparent biases in the archaeological sequence available a few years ago (Chapter 4). These adjustments have not only been made with new evidence of visits to sites other than megamiddens between 3000 and 2000 BP. Corrections have also been made as a consequence of having found that two sites, considered previously (Parkington *et al.* 1986, 1988) to have been occupied only after the 2000 BP, contain deposit dating to before that period (Eland's Bay Open and Pancho's Kitchen Midden). It seems that reliance on surface remains (potsherds) as the only temporal marker for these and other sites might well have resulted in an over-representation of the number of pottery period sites at the expense of those that predate them. Future work on sites not yet excavated and previously considered as mainly dating to the last 2000 years (e.g. Parkington *et al.* 1988: 26) could provide new and interesting surprises.

The recent update on the number of radiocarbon dated occupations and associated volumes of deposit is certainly contributing towards a more complex picture of settlement choices over the last 4500 years. This is particularly true for the megamidden period. One of the most striking features of this period is not only the huge volumes of deposit built up over a thousand years. It is the near absence of occupation of many cave sites, apart from Steenbokfontein Cave between 2200 and 2700 BP. Three out of four dated cave sites facing the sea are situated no more than 300 meters away from the nearest megamidden (Fig. 4.12), but were not visited during the megamidden period. Although this contrast has been briefly mentioned in the literature (Buchanan 1988; Parkington *et al.* 1988; Henshilwood *et al.* 1994), no explanation, nor hypothesis, for this "avoidance" behaviour has been offered.

According to palaeoenvironmental reconstructions (Chapters 3 and 5), ecological and environmental conditions were favourable for hunter-gatherer settlement at both the Lambert's

Bay and Eland's Bay areas during the megamidden period. Hence, the absence of visits to caves and rock shelters and concentrated activity at the megamiddens are not a response to "the extremity of the climate mitigating against a residential move there" (Henshilwood *et al.* 1994: 108). Visits to and occupation at the megamiddens can be easily reconciled with a settlement pattern other than that involving logistical moves between coast and inland locations (see Parkington 1991; Henshilwood *et al.* 1994). In fact, logistical exploitation (close or away from the sources) is frequently found amongst densely populated and/or semi-sedentary hunter-gatherers (Cohen 1985; Ames 1985).

From forty-two (42) mid- to late-Holocene dates obtained from excavations undertaken in the eastern Sandveld (Manhire 1992; SARU data base) and interior mountains (Parkington & Poggenpoel 1971; Thackeray 1977; Kaplan 1987; Nackerdien 1989; Anderson 1991; Halkett 1991; Van Rijssen 1992; SARU data base) only two (2) fall between 3000 and 2000 years BP. Moreover, both were obtained from thin (approximately 10 cm deep) deposits present in two rock shelters (Diepkloof Kraal Shelter and Faraoskop) situated in the Sandveld and not in the interior mountains. It is also possible that settlement in the hinterland between 3000 and 2000 BP consisted mostly of open sites, where organic (and datable) materials have probably not survived. Such a possibility constitutes a moot point because of the difficulty in producing evidence for its confirmation or denial. Nevertheless, the evidence at hand does not support a full integration of coastal and inland locations into a regional settlement pattern during the megamidden period. Visits to the hinterland were probably only occasional, and, consequently, are difficult to trace archaeologically.

Previous suggestions that megamiddens might also constitute the coastal complement of the deflation hollows (Figs 4.1 and 4.2) within the same settlement system (Parkington 1991) is also not supported by recent comparisons between stone tool assemblages of megamidden age and those from the undatable deflation hollows (Jerardino & Yates 1996; see Chapter 7). According to these latter observations and those of Kaplan (1994), putative ages between *c.* 6000 and 3500 BP could be given to the numerous deflation hollows, although more research needs to be undertaken before the period to which these open sites date to is identified. Without further insights into this aspect, Figure 6.1 will remain only a first approximation to the changes in settlement pattern in the research area over the last 6000 years.

In sum, and according to the evidence at hand, people started to revisit the research area once again around 4300 BP, and around 3500 BP the hunter-gatherer population was probably more numerous and organized in larger groups. At about 3000 BP, caves and rock shelters were still inhabited, but megamiddens started to be occupied as well. During the next couple of centuries, until 2100 BP, hunter-gatherer settlement was mostly concentrated at the megamiddens, where domestic activities were undertaken alongside shellfish drying and processing (Henshilwood *et al.* 1994). It is possible that both of these activities were spatially segregated. Shellfish drying and processing might have taken place right behind the rocky reefs, with living and domestic areas around the periphery, where several huts might have been erected. Unfortunately, it is precisely the peripheries of many megamiddens that have suffered destruction due to road and railway works, preparation of agricultural land and farm housing development. However, the remains of what could have been such camps have been observed at Steenbokfontein farm (Jerardino & Yates personal observations). Similarly, Pancho's Kitchen Midden is likely to have constituted one such camp behind the megamidden of Mike Taylor's Midden (Fig. 4.12). Pancho's Kitchen Midden contains ample evidence of having a strong domestic component (see below).

Was Steenbokfontein Cave also the camp site for many of the Grootrif megamiddens? Although plausible, this seems not to have been the case. In developing an hypothesis, it is important to consider the following factors: i) Steenbokfontein Cave, and apparently no other large cave, was chosen for visits during the megamidden period; ii) the size of Steenbokfontein Cave and its prominence in the relatively flat surrounding landscape; and iii) its location situated midway in the geographic distribution of megamiddens (Figs 4.1 and 4.2). The absence of occupation at other caves, despite their proximity to megamiddens and their suitability for habitation, particularly during the relatively wet conditions that characterized the megamidden period (Chapters 3 and 5), cannot be explained in terms other than the existence of "strict rules" of what was considered the right place for living and what was not. Because of its size, location and prominence, Steenbokfontein Cave could well have been regarded as a special focus of coastal hunter-gatherer aggregation during at least part of the megamidden period, whilst the rest of the available sites remained largely ignored for habitation. "The fact that there [was] a wide choice of suitable sites, yet relatively few [were] selected, would suggest that the choice of a site ... was purposeful and therefore held some meaning" (J. Deacon 1988). This observation also seems applicable to the case of Steenbokfontein Cave during the megamidden period, pointing to the relevance of this place (Parkington 1980: 73), beyond reasons justified by resource availability in the near vicinity of the cave site. Family groups could have gathered there seasonally for only a few weeks, occupying perhaps both of the caves on Steenbokfontein kopje as well as the sandy footslopes. After such aggregation events came to an end, people probably dispersed back again along the coast. This hypothetical model is not based solely on the Kalahari ethnography, but also on the fact that many other hunter-gatherer societies around the world follow a similar division of the year into aggregation (public) and dispersal (private) phases (Lee 1979: 360-361). It is entirely possible that foraging societies in the distant past followed a similar pattern of concentration and dispersion, as suggested by other archaeologists (Conkey 1980; Wadley 1987, 1989; Hall 1990).

It is important to remember that Eland's Bay and Lambert's Bay were increasingly populated from 3500 BP onwards, with probably highest population densities in both of these areas during the megamidden period. Hunter-gatherer mobility was also restricted to the coastal strip and adjacent Sandveld, as reflected in the apparent absence of visits to the interior during the megamidden period. Situations of increased residencial permanence and localized population densities have been identified in ethnographic studies among southern African hunter-gatherer societies (Lee 1979: 366-369; Guenther 1975/76; Hitchcock 1982) as charged with tension and conflict. One of the several ways of releasing and mediating such tension is through the intensification of ritual during social gatherings and trance dance, which are common features in San societies (Barnard 1992). The entire camp participates in the dance, and members of visiting groups are specially welcomed to join in because "...curing medicine was thought to be especially effective when many performers entered trance at the same time" (Lee 1979: 365). Healing and sharing rituals amongst San groups are structured and maintained to provide spiritual cohesion and harmony in the community. Through communal dance, "...people confront the uncertainties and contradictions of their experience, attempting to resolve issues dividing the group..." (Katz 1982: 34). Also across the cultural spectrum "...ritual ... may demand, not only cooperative members, but also cooperative preparation for that ritual - as in the case of requisite honouring of prescribed taboos. Improper or uncooperative action may be emphasized and even underscored during the ritual sequence and thus create strong social pressures for proper action " (Laughlin & d'Aquili 1979: 304; see also Johnson 1982: 405-406). In situations of increased social and psychological stress, conflict is mediated and resolved with the help of emergent leaders, such as charismatic ritual specialists and emergent leadership roles

(Guenther 1975; Cohen 1985: 110-112; Johnson 1982: 402). Thus, it is likely that during the megamidden period there was a particular need for gatherings of this kind, with Steenbokfontein Cave as the center-place for these gregarious occasions. This hypothetical reconstruction is tested and further elaborated through observations of site formation processes (see below) and material culture (Chapter 7) recovered from Steenbokfontein Cave.

Towards the end of the megamidden period, occupation of Mike Taylor's Midden was very intense, as inferred from the large volume of archaeological deposit dating to between 2300 to 2000 BP (Figs 4.16 and 6.2). Places along a dune cordon south of Mussel Point were also more frequently visited, although for relatively brief periods. These observations might point to a reorganization of settlement towards the end of the megamidden period. Immediately after 2000 BP, visits to sites were relatively infrequent, bringing potsherds and domestic fauna for the first time to the research area.

SETTLEMENT PATTERNS AT AN INTRA-SITE LEVEL:

Regional settlement patterns in the research area over the last 4500 years were described above, and a first approach to explain some of the unique observations of site choice for the megamidden period was also proposed. The following section of this chapter deals with the evidence for site usage from various sites. This reconstruction presents a different level of spatial resolution to the regional settlement pattern described above. The following set of intra-site observations also provides a test case for the hypothetical use of Steenbokfontein Cave as a place for aggregation during the megamidden period.

Ethnographic parallel and basic assumptions

Among the many efforts to understand the short- and long-term group movements over time and space of mobile hunter-gatherer societies, Yellen's ethnographic observations in the western Kalahari region provide useful and quantified insights (Yellen 1977). This study, however, has received some criticism. Other observations made in the eastern Kalahari have led to alternative interpretations of the spatial organization of residential sites (Hitchcock 1987; Kent & Vierich 1989; Kent 1991). Kent in particular (Kent & Vierich 1989) has argued that the length of time people anticipated spending at a site was an important determinant of site structure, a term which includes areal extent. Nevertheless, the relevance of her studies lies mostly with sedentary or semi-sedentary social groups closely integrated with farming, herding and wage labour, rather than with mobile hunter-gatherers (Kent & Vierich 1989). The strong expectation of, and dependence on, work for others by these semi-acculturated hunter-gatherer groups has certainly modified their economy, subsistence and, consequently, settlement pattern, when compared to hunter-gatherer groups with only little contact with food producer societies. At the time of Yellen's data collection, considerably less contact was observed between !Kung San hunter-gatherers and food producers (Yellen 1977). Most of the occupational history dealt with in this chapter refers to the pre-pastoralist period in the south-western Cape and, consequently, Yellen's observations are here considered the most appropriate ethnographic parallel.

From Yellen's data, it was established that the average area of settlement increased when the size of the occupying social unit also increased. Longer visits, on the other hand, also resulted in a larger area of settlement. Distinctively in this last instance, a greater variety of activities as well as a higher repetition of common tasks also characterized such longer occasions (Yellen 1977). Additionally, it could be expected that the accumulation or discard rate per unit of time of artefacts and dietary remains would increase when the size of the social unit also increased and/or when visits are undertaken for relatively longer occasions.

In the southern African context, one of the most labour-intensive of all the many activities undertaken in a hunter-gatherer camp, is the manufacture of beads from broken ostrich eggshells (OES) by women of different ages (Goodwin & Van Riet Lowe 1929: 269-270; Silberbauer 1964; Marshall 1976). It is very likely that such a time-consuming activity was more frequently undertaken during relatively longer occupations of a site. Fortunately, the archaeological evidence for bead manufacture can be identified confidently by the presence of incomplete or unfinished OES beads. These items consist of perforated, sometimes broken, pieces of OES fragments, normally displaying an irregular shape. Regarding the final products, it has been estimated that some 2000 beads were required for a necklace and 8000 for an apron (Schweitzer 1979), both of which were items of personal adornment during prehistory (J. Deacon 1984). One could also hypothesize that, under circumstances of increased activity and/or longer periods of residence in a camp, there is a higher risk of losing a piece of personal ornament (e.g. finished OES beads) due to wear and accident. Moreover, for every unfinished bead found in archaeological deposits, many more must have been turned into finished ones, some of which might have been incorporated in the deposits. Similar arguments have been constructed by

Wadley (1987) as a means to identify hunter-gatherer aggregation phases in the archaeological record of various sites.

Deposits accumulated during relatively longer occupations could be identified by the presence of relatively larger quantities of incomplete or unfinished OES beads and also finished items of personal ornamentation (e.g., beads and pendants) of any material. Likewise, deposits accumulated during visits of relatively larger groups could be characterized by relatively higher discard rates of stone artefacts and faunal remains and relatively bigger areas of settlement. Quantities of these items can be provided by calculating their densities, or even better by *estimating* their total number present in different deposits and discarded within a period. These estimates can be calculated by multiplying the densities of artefacts and faunal remains (Appendix 2), expressed as numbers or weight per volume (n or g/vol), by the rate at which the corresponding deposits were accumulated (vol/unit time). Numbers of items (or mass) per unit of time and not per unit of volume is the appropriate, and here preferred, unit of comparison.

Archaeological reconstructions of site formation processes are not only dependent on evidence of human activity at sites. Evidence for human absence at sites during part of their time sequences can be equally useful in piecing together particular histories of site occupation. As demonstrated elsewhere (D. M. Avery 1982; H. Deacon & Geleijnse 1988) occupation of cave sites by people and raptors can be assumed to be mutually exclusive, even though each would use different areas within a cave. Raptors use suitable ledges for roosting, whereas people would choose the whole or part of the cave surface. As a consequence of the feeding behaviour of raptors, quantities of regurgitated pellets, comprising microfauna (mice, shrews and lizards), would accumulate immediately below the roosting areas. Thus, archaeological deposits rich in microfaunal remains and relatively poor in artefacts and food residues can be considered as indicative of relatively infrequent visits by people. The frequencies of microfauna obtained from deposits located right below cave ledges may well be greater than elsewhere in the cave. Nonetheless, it is the fluctuations in the frequencies and not the absolute values which monitor a lesser or greater human presence in the cave. The alternative interpretation, that proposes fewer visits by raptors for reasons unrelated to human occupation, must be tested against the available palaeoenvironmental data on a case by case basis. Besides human interference, only extreme environmental changes (e.g. increased aridity and general low productivity) would make it very

Table 6.1: Calculations of total volume and rate of accumulation of deposit for each episode of occupation at Tortoise Cave. Rates of accumulation are rounded off to the nearest whole number.

a) Total volume for the site as a whole:

DATE (BP)	TOT. AREA (m^2)	AVERAGE DEPTH (m)	TOT. VOLUME (m^3)
1800-760	20	0.45	9.0
4020-3160	554	0.50	277.0
4330-4190	18	0.30	5.4

b) Rate of accumulation for the site as a whole:

DATE (BP)	VOL/TIME	RATE (m^3/100 yr)
1800-760	9.0 m^3/1000 yr	1
4020-3160	277.0 m^3/ 860 yr	32
4330-4190	5.4 m^3/ 140 yr	4

Table 6.2: Rate of discard of faunal remains in each episode of occupation at Tortoise Cave, expressed as mass per hundred years (g/100 yr). Cape fur seal (*Arctocephalus pusillus*) bones are not included in the category of mammals.

DATE (BP)	OES	TORTOISE	MAMMAL	FISH
1800-760	99.5	509.6	870.2	984.6
4020-3160	1931.7	16939.7	17556.0	4303.0
4330-4190	457.6	5293.6	7053.6	4988.0

Table 6.3: Rate of discard of stone artefacts, unfinished and finished OES beads and pendants in each episode of occupation at Tortoise Cave, expressed as number of pieces per hundred years (n/100 yr). Stone artefacts include formal tools, utilized flakes and debitage.

DATE (BP)	STONE ARTEFACTS	UNFINISHED OES BEADS	FINISHED BEADS AND PENDANTS
1800-760	120	4	7
4020-3160	33216	576	960
4330-4190	4956	48	80

difficult for these species to roost in caves as frequently as they can. However, such extreme conditions would have also discouraged human visits to the same sites (see Thackeray 1984).

Case studies on site usage

Tortoise Cave:

Details of the stratigraphy, dates and definition of the three main episodes of occupation at Tortoise Cave are given in Chapter 4. As shown in Figure 4.3, marked changes in the areal extent of deposits associated with each of these episodes of occupation are evident. Through careful study of the section drawings (Robey 1984) and site plan, conservative estimates suggest settlement over about 18 m^2 for the first episode of occupation (4330 - 4190 BP), mostly located around the outer portion of the cave. The second episode of occupation (4000 - 3100 BP) is represented by a much larger area, consisting of 554 m^2, which forms the large talus. The settlement associated with the third, and last, episode of occupation took place over an area of approximately 20 m^2, which is entirely confined within the cave (Fig. 4.3).

The rates of deposition were calculated for each of the episodes of occupation at Tortoise Cave with the average depth of the corresponding deposits observed in section drawings (Robey 1984) and the radiocarbon time-spans (Table 4.1). To establish the time-spans, the radiocarbon dates were considered as points in time and not as probability values, the latter being reflected by the associated standard deviation.

From the calculations (Table 6.1), it is clear that a dramatic increase in deposition rate took place between approximately 4000 and 3100 BP at Tortoise Cave. It is important to note that this change was associated with a massive increase in the areal extent of the settlement, evidenced by the large talus (Fig. 4.3). Subsequently, in the last episode of occupation, the deposition rate decreased by 32 times, the lowest in the site. Since the majority of the most recent deposits date to between 1800 and 1580 BP, recalculation of the deposition rates over a time-span of 220 years results in a value four times higher than that previously calculated in Table 6.1b.

Table 6.2 shows the rates of discard of faunal remains per unit of time for each episode of occupation at Tortoise Cave. In this instance, the rates increase substantially (2 to 4 times) in the talus deposits. An exception is observed in the fish category, which shows a minor decrease in the rate of deposition during the talus accumulation. All rates of faunal discard shown in Table 6.2 decreased between 4 and 40 times in the last episode of occupation.

The rate of discard of stone artefacts, unfinished OES beads and finished beads and pendants for each episode of occupation at Tortoise Cave is shown in Table 6.3. From the first to the second episode of occupation the rate of deposition of stone artefacts increases 7 times, and is followed by a dramatic decrease (286 times) in the last episode of occupation. Unfinished OES beads are relatively abundant at the first episode and subsequently increase by one order of magnitude (12 times) during the talus occupation. Later, in the last period, quantities of these artefacts decrease by two orders of magnitude (130-140 times). This latter pattern is repeated by finished beads and pendants (Table 6.3). Broad covariance between frequencies of unfinished OES beads and finished beads has also been observed at various other sites (Plug 1982; Wadley 1987; Mazel 1989; Hall 1990).

According to the evidence presented here (Tables 6.1, 6.2 and 6.3), it is suggested that visits during the talus occupation (4000 - 3100 BP) are likely to have consisted of bigger groups of people who probably spent longer periods of time at Tortoise Cave than groups visiting this site during the first and last episodes of occupation. It is important to note that both areal extent of settlement and rate of faunal and stone artefact discard support the same conclusion regarding the size of the visiting group for each episode of occupation.

When comparing the first (4330 - 4190 BP) and the last episodes of occupation (1800 - 760 BP) at Tortoise Cave in terms of the area of settlement, both occupations were probably characterized by similar sizes of visiting groups (Fig. 4.3). But, from other parameters (Tables 6.2 and 6.3), it is clear that visits to the site during the first episode were longer than during the last one. This conclusion may change in the future if dating and re-dating of Layer 1b and 1a prove that most of the last episode of occupation spans only 250 years.

The recovery efficiency of small cultural remains such as OES beads during field sorting can vary from one excavation season to the next. Hence, it could be suggested that differences between the first and the last episodes of occupation shown in Tables 6.2 and 6.3 are a product of different sorting skills. Although possible, this is probably not the case. Densities and rate of discard of various faunal categories also decrease during the last episode of occupation. A substantial proportion of the Tortoise Cave faunal samples comprises fairly small pieces of bone, many of which were detected by sorters during field excavations.

As mentioned above, ethnographic observations identify women as the principal OES bead manufacturers (Goodwin & Van Riet Lowe 1929; Marshall 1976). Consequently, an alternative interpretation of Table 6.3 could suggest a change in the visiting group composition,

Table 6.4: Residencial permanence indices for several domestic related items at Pancho's Kitchen Midden. Indices were calculated as density ratios of domestic refuse and unfinished OES beads plus finished beads and pendants.

DATE (BP)	STONE	TORTOISE	MAMMAL	SHELL
570-880	430.0	3890.0	1660.0	760.0
2640	42.7	75.4	19.0	65.4
2940-3060	40.0	152.6	50.0	43.3
3570	132.2	191.1	101.1	52.2

Table 6.5: Residencial permanence indices for several domestic related items at Steenbokfontein Cave. Indices were calculated as density ratios of domestic refuse and unfinished OES beads plus finished beads and pendants. The unit of volume used in all density values is a bucket.

DATE (BP)	STONE	TORTOISE	MAMMAL	SHELL
2200	80.0	726.3	184.5	25.4
2360	46.8	169.5	37.6	8.8
2490-2690	35.5	165.3	27.3	5.5
3510-3640	54.8	188.6	123.6	9.9
3990-6070	43.5	96.0	103.7	3.5

Table 6.6: Densities of microfauna, faunal remains (mammals and tortoise), marine shell and stone artefacts from Steenbokfontein Cave. Values are expressed as mass per unit volume (either g/bucket or kg/bucket*) and number of pieces per unit volume (n/bucket#). Stone artefacts include formal tools, utilized flakes and debitage.

DATE (BP)	MICROFAUNA	MAMMAL AND TORTOISE	SHELL*	STONE# ARTEFACTS
2200	16.9	100.2	2.8	8.8
2360	25.5	51.8	2.2	11.7
2490-2690	10.4	86.7	2.5	16.0
3510-3640	5.5	174.8	5.6	30.7
3990-6070	15.0	85.9	1.5	18.7

with women better represented during the talus occupation (4020-3160 BP) than during previous and later occupations. However, by relying on other ethnographic observations and archaeological inferences on women-related artefacts and foods this scenario does not seem to have been the case. Adzes and grindstones as well as shell remains are well represented in all three episodes of occupation. Adzes and grindstones in particular became more common in the stone tool assemblage during the last episode of occupation (Robey 1984; Chapter 7). Well-preserved plant material is also conspicuous in deposits dating to the last 2000 years (Robey 1984). The presence of these four categories has been related frequently to women's activities in the anthropological and archaeological literature (Lee 1979; Mazel & Parkington 1981; Waselkov 1987; Hastorf 1991).

It is therefore concluded that hunter-gatherer visits between 4000 and 3100 BP consisted of relatively larger groups of people who probably spent longer periods of time at Tortoise Cave than before 4000 BP or after 1800 BP.

Pancho's Kitchen Midden:

Although the chronological control of the occupational sequence at this site is good, the size of the excavation (Fig. 4.4) is not large enough to allow for the secure calculation of rates of accumulation. To overcome this problem, a ratio can be established between any density value derived from domestic activities (Appendix 2) and the sum density of unfinished OES beads and finished beads and pendants. The calculated index (an index of residencial permanence) can be considered an approximate and relative measure of the length of visits at a particular site. The smaller the value of this index, the more unfinished and finished beads are present per unit domestic refuse, and consequently, the longer the time spent at the site. Trends of the calculated indices can be subsequently compared against observations on specific site formation processes in order to check on the inferences drawn from these indices.

Table 6.4 shows the indices for residencial permanence for several items related to domestic activities at Pancho's Kitchen Midden. Only those items comprising the bulk of the excavated deposits from this site were included in the calculations, thus, OES and fish bone densities were not considered as they generally appear in very low densities. Overall, smallest indices are associated with occupations dating to *c.* 2600 BP (Layer 3) and also between *c.* 2900 and 3100 BP (Layers 4 to 6). These low residencial indices seem to suggest that hunter-gatherer groups made longer visits to Pancho's Kitchen Midden between 3100 and 2600 BP than during previous and latter occupations.

These results are confirmed by the stratigraphic sequence and chronology of Pancho's Kitchen Midden. Figure 4.5 shows that at least half of the site's deposits were accumulated between *c.* 3100 and 2600 BP, which is precisely the period of time when visits are expected to have lasted for relatively longer periods (Table 6.4). As already predicted (see above), longer visits to a site can easily result in an increase in the deposition rates of archaeological material. Further excavations at Pancho's Kitchen Midden over a number of other squares will allow the calculation of concrete values for the deposition rates at this site, as has already been done for Tortoise Cave (Table 6.1b). Whatever these values might be, it is clear that the fastest deposition rates at Pancho's Kitchen Midden are associated with the period between *c.* 3100 and 2600 BP. It is suggested that an increase in hunter-gatherer residencial permanence at this site was conducive to the fast accumulation of archaeological deposit during this period.

Steenbokfontein Cave:

Calculation of deposition rates in this instance is not possible for the same reasons as for Pancho's Kitchen Midden (see above). Consequently, indices of residencial permanence were established (Table 6.5) instead of deposition rates. Here again, only those items comprising the bulk of the excavated deposits from this site were included in the calculations. Overall, the smallest indices are associated with occupations dating to between *c.* 6100 BP and 2400 BP (Layers 4b to 2), and largest with visits dating to 2200 BP (Layer 1). It is possible to suggest from these results (Table 6.5) that hunter-gatherer groups made longer visits to Steenbokfontein Cave between 6100 and 2400 BP than during the latest occupation around 2200 BP.

Steenbokfontein Cave deposits are rich in microfaunal remains when compared to other sites in the area (personal observation). Thus, a comparison between the densities of microfauna and those of artefacts and dietary remains (Appendix 2) can be established in order to obtain some indications of the relative frequency of visits to this site by groups of people. As expected, densities of microfauna are inversely correlated with that of faunal and cultural remains (Table 6.6), with the sole exception of the category of stone artefacts in Layer 1. Highest densities of microfauna and lowest densities of those remains left in the cave by people in Layers 1, 2 and 4b are interpreted as an indication of relatively infrequent visits by people between *c.* 2200 and 2400 BP and between *c.* 4000 and 6100 BP. The extremely low densities of microfauna in Layer 4a

Table 6.7: Summary observations of three measures of intensity of site usage at Steenbokfontein Cave.

DATE (BP)	LAYER	RESIDENCIAL PERMANENCE	FREQUENCY OF VISITS	DEPOSITION RATES
2200	1	low	low	high
2360	2	high	lowest	moderate
2490-2690	3	high	moderate	high
3510-3640	4a	high	high	highest
3990-6070	4b	high	low	low

Table 6.8: Total mass of faunal remains and number of flaked stone artefacts for various megamiddens and Tortoise Cave. Calculations were based on conservative estimates of areal extent and depth of deposits, as well as average density of bone (A.D.B) and lithic material (A.D.S). Dimensions of middens are expressed in meters, mass of bone in grams and estimates of volume in buckets. Cubic meters were converted into bucket numbers by multiplying them by a factor of 65.

SITE	DEPTH	WIDTH	LENGTH	VOLUME	A.D.B	A.D.S	TOTAL BONE	TOTAL STONE
Malkoppan	0.15	40	300	117000	0.1	-	11700	-
Grootrif D	1.00	60	200	780000	5.1	0.36	3978000	280800
Cape Deseada	0.15	25	250	60937	4.8	1.80	292497	109686
Railway	0.10	70	800	364000	0.2	-	72800	-
Mike Taylor's	1.00	100	200	1300000	1.3	-	1690000	-
Tortoise Cave							380683	295297

are indeed believed to be the reflection of frequent visits by people to the cave (and infrequent by raptors) and not the product of their partial destruction by the intense burning of these deposits (Chapter 4). Many of the preserved microfaunal bones in Layer 4a included tiny mandibles of lizards, an observation that points to the relatively good preservation of microfaunal remains in Layer 4a.

By examining the chronological and stratigraphical sequence of Steenbokfontein Cave (Table 4.1; Figs 4.8 and 4.9) it is possible to differentiate between those occupational events (stratigraphic layers) during which deposits accumulated relatively fast and those that accumulated relatively slowly. Although no concrete numbers support these observations, as is positively the case at Tortoise Cave (Table 6.1b), differences from one occupational event to the next are pronounced. Consequently, these observations are assumed to reflect broad patterns of site usage at Steenbokfontein Cave.

Layer 4b was accumulated over a time span of nearly 2100 years pointing to very slow deposition rates. Layer 4a in contrast accumulated only over a period of approximately 150 years, with a depth of deposit comparable to that of Layer 4b. Layer 3 was built up over a period of approximately 500 years, considering that the beginning of its accumulation probably started around 3000 BP instead of *c.* 2700 BP (see Chapter 4). At least half of the second basin infill deposits (Fig. 4.7) consist of Layer 3, an observation supported by section drawings (Fig. 4.8) and photographic material. This evidence points to Layer 3 as having accumulated relatively fast, but perhaps not as fast as Layer 4a. Layer 2 is represented by very thin and sandy deposits of no more than 250 mm in depth formed over no more than 300 years. Hence, the deposition rate during the accumulation of Layer 2 seems to have been relatively slow. Radiocarbon dating of top and bottom samples obtained from Layer 1 shows identical dates. These somewhat unusual results are probably the outcome of pronounced distortions in the radiocarbon date calibration curve (Stuiver & Becker 1993), as these dates fall within a one of the three major "ambiguous regions" described for the last 4500 years (see above). Nevertheless, it seems safe to assume on the basis of the date for Layer 2 (Table 4.1) that a maximum of 200 years lapsed between the onset and end of Layer 1. Considering that Layer 1 constitutes approximately a third of the second basin infill material (Figs 4.7, 4.8, 4.9), deposition rates seem to have increased once again during this occupational event.

Table 6.7 summarizes the observations on residencial permanence, frequency of visits and deposition rates, expressed as qualitative data. Clearly, Layer 3 and, particularly Layer 4a, rank as events of relatively intense occupation at Steenbokfontein Cave. Hence, hunter-gatherer settlement from about 3500 BP to *c.* 2500 BP is likely to have consisted of relatively frequent and longer visits to this site than before or after that period.

During this period of intense occupation of Steenbokfontein Cave, two basins were dug by the prehistoric inhabitants, both of which were rapidly filled up as a consequence of people's intense activity at this site. In both instances, the removal of material was more than just an exercise to even out the surface of the cave. Unlike some of the smaller basins dug up in Eland's Bay Cave and Tortoise Cave (Parkington 1976a; Robey 1984), the creation of these two basins in Steenbokfontein Cave seem to be related to purposes other than increasing the size of the living space. The cave ceiling was probably several meters above people's heads by the time these basins were created. It is suggested that both basins might rather represent two instances where a decision was taken to mark Steenbokfontein Cave as a site with a special identity. Space was shaped purposefully probably in order to create a new meaning for Steenbokfontein Cave. Hence, visits to this site during the creation and filling of these basins were to some extent different in character to those preceding and postdating them, as it has already been suggested in the preceding section of this chapter. Steenbokfontein Cave was invested with a new identity in two occasions around 3500 and 2700 BP, and partly as a consequence of this, visits to this site were more prolonged.

Megamiddens:

Shellfish drying for purposes of delayed consumption was probably a prominent activity at several of these megamiddens, as shown by the massive amount of shell remains and various quantities of charcoal at these sites (Buchanan 1988; Henshilwood *et al.* 1994). However, evidence for the consumption of terrestrial fauna is also present in every single megamidden, and stone knapping was certainly performed at most of them (Appendix 2).

According to observations on the contents of various megamiddens (Appendix 2), there is no reason to support a monolithic and homogeneous characterization of these sites as has been suggested until recently (Buchanan 1988; Parkington 1987a; 1991; Parkington *et al.* 1988; Henshilwood *et al.* 1994). Quantities of faunal remains, stone artefacts and charcoal vary from one megamidden to another *when compared to the respective shell frequencies.* For instance, quantities of faunal remains at Grootrif D and Cape Deseada Midden (test pit #2) are twice as abundant as in the rest of the sampled megamiddens (Appendix 2). Additional variability is also observed within broadly contemporary occupations of the same megamidden, as shown from analytical results from test pit #1 and #2 of Cape Deseada Midden and Railway Midden (Appendix 2).

Further variations in the contents of several megamiddens can also be confirmed through their sequence. In this instance, observations gathered from Grootrif D and Mike Taylor's Midden are particularly informative, as changes in the contents of fauna, charcoal and flaked stone categories correspond with marked changes in their respective stratigraphic sequences. Although observations on shell densities are not complete for Grootrif D sequence, it is clear that highest densities of both fauna and flaked stone artefacts are present between units 4 and 8 and also in units 17 and 18 (Appendix 2), which are characterized as relatively rich in shell remains (Chapter 4; Figure 4.11).

On the other hand, excavation E9 at Mike Taylor's Midden shows that highest densities of bone remains are associated with relatively low densities of shell (Appendix 2: units FS6b, WS2, WS3, BARN1). This is particularly evident in lenses lacking an organic matrix (Fig. 4.16), such as in WS and BARN units. Furthermore, charcoal quantities vary independently from any observable changes in the stratigraphy. Consequently, it is suggested that the stratigraphic changes observed at Grootrif D and Mike Taylor's Midden, which occur in association with shifts in their contents, can be interpreted as lateral changes in the spatial configuration of activity areas at these sites through time. An hypothetical example of this scenario would be to imagine a superimposition of several Dune Field Midden sites (Parkington *et al.* 1992), in which the location of specific activity areas changed from one series of occupations to the next.

Clearly, the evidence presented here supports the concept of megamidden sites as more than just shellfish processing and drying stations (Henshilwood *et al.* 1994), but as sites where also other activities were performed. These activities were related to more domestic purposes and their location probably shifted within the fairly extended limits of megamidden surface areas. These lateral shifts might have also involved areas behind megamiddens, many of which have been destroyed by recent building and road development, where camps might have been erected in the past (see above). The variability in megamidden contents through time and space is also entirely congruent with the idea that some megamiddens were visited mainly for shellfish drying and processing, and others for a combination of purposes including the settlement of family groups.

As already mentioned, megamiddens have usually been described as very poor in faunal and cultural remains. This is certainly true when density observations from megamiddens are compared to those of cave sites and rock shelters (Appendix 2). However, a different picture emerges when comparisons are based on estimates of total mass of bone and number of artefacts instead of densities of the same findings. Table 6.8 presents these results for several megamiddens.

The conservative estimates of total weight of bone remains and number of flaked stone artefacts at Grootrif D, Cape Deseada Midden and Mike Taylor's Midden (Table 6.8) are similar to, or greater than, that of Tortoise Cave over a period of at least 2000 years of human occupation. In fact, Grootrif D and Mike Taylor's Midden contain total weights of bone of one order of magnitude greater than that of Tortoise Cave. Unfortunately, no other cave site or shelter is presented here for purposes of comparison because of insufficient data (see above). Regarding flaked stone artefacts, these were not present in deposits dating to the megamidden period at Malkoppan, Railway Midden and Mike Taylor's Midden. Nevertheless, flaked stone artefacts were recovered from previous excavations at Mike Taylor's Midden (Chapter 4), and consequently, their absence at these sites might be just a product of sampling biases. If a minimum average density of flaked stone artefacts of 0.1 n/bkt is assumed for this latter site, a total of 130 000 stone artefacts are suggested to be contained in the deposits of Mike Taylor's Midden.

The sheer quantities of shells present at megamiddens has certainly obscured and biased the perception of these sites as nearly depleted of faunal and cultural remains. Nevertheless, it is evident from Table 6.8 that megamiddens are not merely witnesses of greatest deposition rates of shellfish, as has usually been stressed (Buchanan 1988; Parkington 1987a, 1991; Henshilwood *et al.* 1994). Despite the relatively poor preservation of organic remains at these large open shell middens a vast amount of terrestrial fauna is present in each megamidden (Table 6.8). But, because of the overwhelming quantities of marine shells comprising the bulk of megamidden deposits, terrestrial fauna and lithic remains have remained "invisible" to the impressionable and intuitive human eye. In fact, the rates at which bone and lithic material were discarded during the build up of the megamiddens were the highest ever since sea levels stabilized to present mark after the last glaciation, if not before that time. In other words, over approximately a thousand years of megamidden occupation, significantly more bone and flaked stone artefacts were accumulated than during hypothetically simultaneous occupations of Tortoise Cave (Table 6.8), Spring Cave and Eland's Bay Cave (R. Yates pers. comm.) over the same period of time.

Although the majority of megamiddens lack deposits dating to the second half of the 3000 - 2000 BP millennium (Table 4.1), deposition rates at some of the megamiddens (Mike Taylor's Midden, Grootrif D) seem still to have been high around that time. The apparent absence of deposits dating to between 2500 and 2000 BP at several megamiddens could well be in part a reflection of their destruction by tourist car park areas located on top. However, dates obtained from near the surface of Mike Taylor's Midden (Table 4.1), and the stratigraphy (Fig. 4.16) as well as contents of this midden (Appendix 2), show clearly that the high deposition rates that characterized the megamidden period dropped significantly just after 2000 BP.

INTEGRATION OF REGIONAL AND SITE LEVEL SETTLEMENT PATTERNS:

Observations on site formation processes are particularly useful in the reconstruction of regional settlement patterns when a number of sites have been analyzed. But it is also true to say that it is difficult to know precisely how many sites are needed in order to obtain a representative sample for site usage for an area under study. Nevertheless, the number of case studies presented in this chapter is considered to be adequate for a first reassessment of the settlement choices in the study area. This seems to be the case, as observations from broadly contemporary site sequences and those gathered from the regional settlement reconstruction (Fig. 6.2) converge into similar scenarios. This conclusion, however, does not in any way preclude the continuation of these kind of studies in the research area.

On average, the size of hunter-gatherer groups were significantly larger after 4000 BP than before this date. At about the same time, longer visits to several sites characterized the settlement at them, particularly between 3500 and 2500 BP. Tortoise Cave and Steenbokfontein Cave were intensively used around 3500 BP, right at a time when several new sites were occupied for the first time.

Subsequently, this trend of intense use of sites and landscape initiated around 3500 BP reached a peak during the megamidden period, which coincided with a change of preferred site from caves and shelters to large open sites. This trajectory of changes in settlement patterns is interpreted as an indication of a fairly rapid population increase in the research area. Population densities seem also to have increased in this area because the movement of people from the coast to the interior was not possible during the megamidden period. According to the evidence presented here, hunter-gatherer mobility was circumscribed to the coastal plain between 3000 and 2000 years ago, a situation that allowed only for movements along a north-south axis. An increase in population densities during the megamidden period is also supported by the human skeletal record obtained for the western Cape coast dating to the last 6000 years (Sealy & Van der Merwe 1988; Sealy 1989). Of the total number of skeletons found in this region, nearly 40% date to between 3000 and 2000 BP.

The concept of a proper place for habitation during the megamidden period was probably radically different to that before and after it, as only a fraction of all sites available for occupation were used despite clear signs of fast "landscape infilling". Steenbokfontein Cave was apparently the only cave site visited frequently during the megamidden period. Visits to this site from around 2700 to 2500 BP were relatively frequent and of intense character. Occupation of other suitable places for habitation in and around the prominent outcrop where this cave is located is also likely to have happened, although it is not possible to prove at this stage. It is suggested that Steenbokfontein Cave was repeatedly occupied for purposes of aggregation during these few centuries, and perhaps also around 3500 BP.

Ritual mediation of stress and conflict resulting from the unusually high densities of people in the research area was probably the main purpose of these visits to Steenbokfontein Cave (see Chapter 7 for the material evidence). This ritual mediation is likely to have taken the form of long lasting and communal trance dances and curing as observed in similar situations of social stress in the Kalahari (Guenther 1975, 1975/76). Story telling, youths' initiation, marriage brokering, exchange of gifts and information were activities that, combined in one way or another, were probably an integral part of the intense social life surrounding these types of gatherings (Marshall 1976; Lee 1979; Silberbauer 1981). The purpose behind exchanging presents was probably more developed "...into one in which people exchange gifts to smooth over relations rather than to gain access to goods and resources..." (Wiessner 1982: 82), because the productivity of the environment (marine and terrestrial) was overall relatively high during part of the megamidden period.

It seems that stress during the megamidden period was mainly social stress brought about by too many people sharing the same area and being unable to resolve conflict and tension by group fission. Reason for this failure are not well understood at the moment, but might have been related to an ever stronger identification with the landscape by the people who inhabited it, and gave new social meanings to it (see J. Deacon 1988; Hall 1990; Chapters 7 and 8).

Ecological stress seems not to have emerged as an important variable between 3500 and 2500 years ago as such signs are not evident (e.g. population pressure leading to over-exploitation of resources; see Chapter 5) in the archaeological record. Furthermore, the general ecological productivity of the research area was relatively high at that time (Chapters 3 and 5), whereby an increase in population levels could have been easily accommodated by the environment. A reconfiguration of the subsistence strategy and shift in diet can be expected as a sensible response to rising numbers of people. Such changes, however, need not necessarily reflect actual food shortage. Further assessments on these matters are discussed in Chapter 8.

Wadley (1987, 1989) has proposed a method for the identification of aggregation and dispersal sites based on the assumption that aggregation in the distant past included the active maintenance of an exchange and risk management system known as *hxaro* among the !Kung San (Lee 1979; Wiessner 1982). Thus according to Wadley (1987, 1989), the recognition of aggregation sites depends on the identification of highly formalized tool kits in which segments contribute to a significant proportion, a greater variety of stone raw materials, relatively abundant ornaments and other gift items of different sorts, the presence of objects with mystical and religious significance, and a greater emphasis on hunting. Whether formal aggregation phases at Steenbokfontein Cave during part of the megamidden period followed the material expression of *hxaro* practice is debatable. The archaeological definition of aggregation by Wadley is certainly very narrow and strictly dependent on the "ethnographic present". Whilst aggregation and dispersal might well have been a dominant feature in hunter-gatherer lifestyle in the past, this does not necessarily imply that the material manifestation of this behaviour should inevitably match that of the Kalahari. Moreover, the *hxaro* system is not ubiquitous among southern Kalahari San groups (Barnard 1992). Nevertheless, to argue either for *hxaro* or for aggregation of any kind in Steenbokfontein Cave needs also the support of adequate evidence resulting from the analysis of the excavated material recovered from this particular site. This is one of the several points of discussion addressed in Chapters 7 and 8.

Again based on modern ethnographic observations, Wadley (1987, 1989) has also suggested that the frequency with which bands aggregated in the past was partly dependent on stress. Frequent social interaction and ritual are important components within a broad spectrum of mechanisms to cope with initial stages of ecological and social stress in many societies (Laughlin & d'Aquili 1979). Under these particular circumstances, aggregation can be expected to take place frequently and become formalized at a particular place or area. Nevertheless, when these mechanisms became ineffective in controlling social stress, particularly under increased ecological stress, hunter-gatherer communities would turn to alternative coping mechanisms including: i) group fission into smaller social units and withdrawal to separate areas, ii) a change from generalized to balanced reciprocity, iii) an emphasis on territoriality by maintaining boundaries and by decreasing the number of trips outside these to a minimum, iv) assimilation by a dominant society in a situation of contact with other groups, v) radical structural change of society involving either the development of a revitalization movement or a transformation of ritual with the addition of newly adopted elements (Laughlin & d'Aquili 1979; Hitchcock 1982; Cashdan 1983). All of these possibilities need to be born in mind when interpreting the latter part of the megamidden archaeological record.

After 2500 BP, either Steenbokfontein Cave ceased to be a focus of aggregation, or it was taking place elsewhere, or such events became less frequent altogether. The large and south-east facing cave located in the same outcrop where Steenbokfontein Cave is situated could well have offered the right conditions for such gatherings. Eland's Bay Cave might have constituted a new, or alternative place for aggregation considering that there is evidence for occupation in this site dating to *c.* 2200 BP (Table 4.1).

It is also possible that the high levels of social stress and perhaps the beginnings of ecological stress after 2500 BP might have no longer been possible to resolve through ritual. Consequently, the reinforcement of social obligations centred around Steenbokfontein Cave would have come to an end, as appears to have been the case. Under these circumstances, people would have been left with fewer options for resolving and coping with uncertainty, contradiction and conflict.

Two such alternative responses that could be traced in the archaeological record might have consisted of groups moving to the periphery or away from the research area, and/or withdrawing to smaller pockets of the landscape where groups could have exercised exclusive rights or ownership. These decisions might be partly reflected in the relatively intense occupation of Mike Taylor's Midden after 2500 BP (Table 4.1) and the "late megamidden" presence of dune cordon sites, all of which sites are situated to the south of the Eland's Bay area. Residential movements to the north of Steenbokfontein Cave are still to be tested with more intensive survey observations. Furthermore, the resumption of visits to Eland's Bay Cave around 2200 BP could also represent a relaxation of previous strict rules regarding ideas about sites unsuitable for residential occupation, that were probably reinforced at ritualized gatherings during previous centuries. If stress coping responses were reformulated towards the end of the megamidden period this seems to have coincided with the cessation of communal aggregation events at Steenbokfontein Cave. Both phenomena might be the expression of the dislocation of previous social networks amongst coastal hunter-gatherer groups in the research area. These hypotheses allow for further testing against the artefactual and subsistence record (Chapters 7 and 8).

The period around 2100 BP saw an abrupt end to the pattern of intense site occupation, relatively long residencial permanence, circumscribed mobility and high population densities. Mike Taylor's Midden was probably visited less frequently after that date and Steenbokfontein Cave might have been abandoned about the same time, unless further excavations at this site reveal the existence of deposits postdating 2200 BP. The settlement pattern after 2000 BP seems to have shifted to that of small groups undertaking frequent residential moves between a range of different types of sites and spending relatively little time at anyone of them, and leaving behind new items in the archaeological record, such as domestic fauna (sheep) and potsherds. This set of observations confirms previous reconstructions in settlement patterns in the research area during the last 2000 years (Parkington *et al.* 1986). The introduction of the pastoralist economy with its particular set of values and social behaviour might well have been a major cause that triggered the disruption of the settlement patterns documented immediately before 2000 years ago. One should not assume, however, that these changes were born out of conflict alone (Parkington *et al.* 1986; Anderson 1991), rather than accommodation through a range of different relationships (Jolly 1994), including assimilation to some degree.

SUMMARY:

The basic trend behind the observable changes in settlement patterns in the Lambert's Bay and Eland's Bay areas is that of increasing population densities from about 3500 BP until 2000 BP, followed by a sharp decline in population levels immediately after 2000 BP. The most salient characteristics of this process are the following.

4500 - 3000 BP

Reoccupation of the study area happened around 4330 BP after a period of very infrequent visits during the mid-Holocene. A range of different types of sites were visited during this period, all of which are situated within different distances to the coast, sometimes up to five and eight kilometers away. First signs of increasing population densities are indicated by the occupation of sites not previously inhabited around 3500 BP and the intense use of both Tortoise Cave and Steenbokfontein Cave sites. The size of visiting groups seems to have increased, and longer residencial permanence appears to have become more frequent around this time as well. Intensity of site occupation continued to increase towards the end of this period, as shown at Pancho's Kitchen Midden.

3000 - 2000 BP

The overwhelming majority of sites (megamiddens) occupied during this millennium are situated at a short distance from the coast and in open locations. Occupation at megamiddens involved a residential component and activities related to a particular subsistence strategy consisting of massive shellfish exploitation and processing. It appears that both of these activities were spatially segregated. The spatial distribution of these activities is also likely to have changed through time.

Population densities were greatest during this period and little contact was established between coast and interior. Situations of potential conflict and tension became more frequent due to the growing numbers of people and larger group sizes unable to resort to fission for resolving such problems. The resulting rise in social stress was mediated by ritual intensification during special gatherings at Steenbokfontein Cave.

Population levels continued to increase towards the end of the megamidden period and ecological stress might have started to be an important variable by that time as well. Two possible scenarios emerge here: i) Ritual mediation of conflict continued to play an important role in minimizing the possibility of inter and intra-group conflict, although its performance changed locale from Steenbokfontein Cave to another site. Reasons for this change are as yet unknown. ii) Ritual mediation of inter-group conflict was no longer effective and ceased to exist to a large extent, forcing hunter-gatherer groups to find alternative answers such as the occupation of available areas around the periphery of the study area as well as previously abandoned sites.

post 2000 BP

Visits to the research area changed in character and quantity immediately after 2000 BP, a date that also marks the beginnings of the introduction of ceramics and sheep in the western

Cape. It is almost certain that both events were related. However, a more complex path of changes in hunter-gatherer life style and behaviour than previously thought was probably underway, given that the social conditions towards the end of the megamidden period were inherently more unstable than before 3000 BP. Overall, during the centuries after 2000 BP, a wide range of sites were visited for short periods of time by small groups of people.

CHAPTER 7

MATERIAL CULTURE

INTRODUCTION:

Studies regarding pre-colonial material culture in the Lambert's Bay and Eland's Bay areas has been mostly concerned with lithic analyses. A few detailed reports of non-lithic artefacts, however, have been produced for two sites located in the periphery of this area (Parkington & Poggenpoel 1987; Manhire 1993). Moreover, an extensive study on OES bead manufacture and its cultural significance is also underway (Yates in prep.).

Stone tool analyses were initially designed to establish the relationship of inter-assemblage variability to subsistence activities and seasonal scheduling across the landscape (Parkington 1980, 1984b, 1987c; Mazel & Parkington 1981). Subsequent excavation and dating of one stratified shell midden (Robey 1984, 1987) and the analysis of stone tool assemblages present in deflation hollows (Figs 4.1 and 4.2) revealed widespread changes in stone tool kits over time (Manhire 1984, 1987; Manhire *et al.* 1984). Particularly, it was suggested that stone tool assemblages dating to between 4000 and 1700 BP were dominated by scrapers and backed pieces, and were located mostly in deflation hollows rather than rock shelters. Adze-rich assemblages post-dated the former and appeared in association with the remains of domestic stock and ceramics. This increase in adzes and abundant associated organic material, particularly plant remains, were interpreted as a reflection of radical changes in hunter-gatherer subsistence strategy and settlement, both of which were suggested to have resulted from a stressful and competitive relationship between local hunter-gatherer and intruding pastoralist groups (Manhire *et al.* 1984; Parkington *et al.* 1986). This chronological sequence, however, lacked any observations dating to the 3000 - 2000 BP millenium, and a scraper/backed piece dominated assemblage was thus initially assumed for this period (Manhire 1984, 1987; Manhire *et al.* 1984; Robey 1984, 1987; Parkington *et al.* 1988). Subsequently, this picture appeared not to be as consistent as was once thought as a result of excavations in the mountain interior and Sandveld (Nackerdien 1989; Manhire 1993), where adze frequencies seemed to have already increased around 3500 - 2500 BP, long before the appearance of domestic stock and ceramics in the south western Cape. These observations, however, were the result of small scale excavations and needed to be confirmed by data obtained from other contemporary sites, particularly from the coast where most of the stratified sites are located.

This chapter examines aspects of material culture, such as lithic and non-lithic artefacts, recovered from Tortoise Cave, Pancho's Kitchen Midden, and Steenbokfontein Cave. An emphasis will be placed on the analysis of stone artefacts with the aim of: i) reconstructing a more complete local stone artefact sequence for the late-Holocene by including observations for the 3000 to 2000 BP period, ii) establishing any shifts in hunter-gatherer mobility as inferred from changes in stone raw materials and stone tool composition through both time and geographical setting, iii) characterizing the excavated sites in terms of the most frequent range of activities undertaken during their pre-colonial occupation. Regarding the latter objective, the analysis of non-lithic artefacts provides important additional observations.

Methods and definitions

Re-analysis of Tortoise Cave stone tool assemblage was not possible, because a substantial part of this assemblage has not been located subsequent to the analysis by Robey (1984). Additional stone artefact counts were included in the re-calculations of frequencies for Tortoise Cave according to the new stratigraphic sequence (Chapter 4), as a number of pieces were encountered during the sorting of shellfish samples (Chapter 5). Final frequency values were obtained by adding these new counts to Robey's raw entries. Results are presented for each stratigraphic layer, and observations for groups of layers are also reported for purposes of inter-site comparison.

The analysis of flaked stone artefact assemblages reported here is based on the schema devised by J. Deacon (1984), with the addition of Minimal Cores to the listed categories of stone artefacts. This term is derived from Volman's (1981) Middle Stone Age study, in which such cores were represented by pieces of stone that have had less than three removals. Hence, Minimal Cores would be included amongst chunks in Deacon's original schema. The purpose behind defining and quantifying this category was to allow for another measure of "expedientness" present in stone tool assemblages. This character is also reflected in the category of utilized pieces (e.g. utilized flakes), and to some extent also by Miscellaneous Retouched Pieces (MRP). For reasons stated above, Minimal Cores are not reported for Tortoise Cave.

In the case of non-flaked stone artefacts (elsewhere referred to as part of the general category of "utilized", "abraded" or "other modified stone"), an attempt was made to refit fragmented pieces in order to avoid double counts. The term "groundstone" was employed for those hard stones showing some evidence of abrasion in one of their surfaces, but clearly not as smooth as in the case of proper grindstones. In those cases where hammerstones showed evidence of also having been used as grindstones, double counting was avoided by adopting the category of hammerstone/grindstone. A distinction was made between those artefacts where pigment staining was present and those where it was absent. The categories of ochred stones and ochred rocks were defined according to their size, once all examples were laid together on a surface and separated into a group of large and another group of small artefacts. Each object was measured and the dividing size mark between the two groups was that of 385 cm^3. Consequently, those pieces that are $\leq$ 385 cm^3 were classified as ochred stones, and those that exceeded this mark were labelled under the rubric of ochred rocks.

As is characteristic of many sites in the research area, stone raw materials consisted of quartz, quartzite, cryptocrystalline silicates (CCS), silcrete, hornfels and "other". Quartz and quartzite are the most abundant raw materials in the research area, and are also ubiquitous in the interior Sandveld and adjacent mountains. Quartz is available as thin veins or small pebbles included in the Table Mountain Sandstone (TMS) formation (see Chapter 3), whilst quartzite is present in the local formation as varying grades of metamorphosed sandstone. Quartzite pebbles and cobbles can also be found as part of river and beach gravels.

CCS includes a variety of fine grained stones, and their sources can be found in the Malmesbury formation located east of the coastal Sandveld (South Africa: 1: 250.000 geological map series, 3218 Clanwilliam). It is also not unusual to find small CCS pebbles included in the local TMS conglomerate that characterizes many of the rock outcrops in the study area (personal observation). CCS is also found nearly 50 km north of Lambert's Bay in the area surrounding the Olifants river mouth (Yates pers. comm.).

Silcrete is frequently found in deeply weathered soil profiles to the south and south east of the study area, more precisely, in the Vredenburg Peninsula and Malmesbury formations, respectively (South Africa: 1: 250.000 geological map series, 3218 Clanwilliam). Silcrete is also found around the Olifants river mouth area (R. Yates & A. Manhire pers. comm.). No natural source of silcrete has been reported for the study area and adjacent Sandveld.

Sources of hornfels are restricted to the east of the study area in the Karoo interior (South Africa: 1: 250.000 geological map series, 3220 Sutherland), but small quantities of pebbles can get carried down the Olifants river across the Sandveld and to the coastal fringe. Varieties of hornfels are also present as small and isolated spots in the Malmesbury area (Yates pers. comm).

Table 7.1: Summary data of flaked stone artefacts from Tortoise Cave. MRP: miscellaneous retouched piece.

LAYER	1A		1B		2A		2B		3A		3B		5		6		7		8		10		11		13A	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
WASTE:																										
Chunks	63	39.6	18	38.3	28	51.9	44	44.9	55	33.5	162	33.2	166	29.1	190	20.3	183	19.9	155	22.6	406	21.1	195	27.2	314	24.3
Chips	36	22.6	8	17.0	7	13.0	10	10.2	23	14.0	135	27.7	183	32.0	386	41.2	352	38.3	293	42.7	553	28.7	169	23.8	373	28.8
Flakes	43	27.0	18	38.3	14	25.9	33	33.7	58	35.4	149	30.5	150	26.3	257	27.5	261	28.3	179	26.1	658	34.2	230	32.4	462	35.7
Blades	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	5	1.0	1	0.2	3	0.3	5	0.5	2	0.3	9	0.5	2	0.3	6	0.5
Bladelets	2	1.3	-	0.0	-	0.0	2	2.0	5	3.0	6	1.2	9	1.6	22	2.4	30	3.3	14	2.0	68	3.5	33	4.7	3	0.2
Subtotal waste	144	**90.6**	44	**93.6**	49	**90.7**	89	**90.8**	141	**86.0**	457	**93.6**	509	**89.1**	858	**91.7**	832	**90.3**	643	**93.7**	1694	**88.0**	627	**88.4**	1158	**89.6**
CORES:																										
Bipolar	2	1.3	-	0.0	-	0.0	1	1.0	4	2.4	8	1.6	7	1.2	11	1.2	13	1.4	6	0.9	25	1.3	6	0.8	14	1.1
Bladelet	-	0.0	-	0.0	-	0.0	1	1.0	1	0.6	-	0.0	-	0.0	2	0.2	1	0.1	-	0.0	10	0.5	3	0.4	3	0.2
Irregular	-	0.0	-	0.0	1	1.9	1	1.0	2	1.2	8	1.6	1	0.2	5	0.5	8	0.9	7	1.0	18	0.9	8	1.1	9	0.7
Regular	2	1.3	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	3	0.5	1	0.1	1	0.1	-	0.0	9	0.5	5	0.7	7	0.5
Subtotal cores	4	**2.5**	-	**0.0**	1	**1.9**	3	**3.1**	7	**4.3**	16	**3.3**	11	**1.9**	19	**2.0**	23	**2.5**	13	**1.9**	62	**3.2**	22	**3.1**	33	**2.6**
UTILISED PIECES	7	**4.4**	3	**6.4**	2	**3.7**	6	**6.1**	6	**3.7**	8	**1.6**	26	**4.6**	29	**3.1**	31	**3.4**	9	**1.3**	72	**3.7**	34	**4.8**	44	**3.4**
FORMAL TOOLS:																										
Convex scrapers	1	0.6	-	0.0	-	0.0	-	0.0	3	1.8	1	0.2	14	2.5	13	1.4	16	1.7	2	0.3	48	2.5	15	2.1	20	1.5
Backed scraper	-	0.0	-	0.0	-	0.0	-	0.0	1	0.6	-	0.0	1	0.2	2	0.2	3	0.3	3	0.4	1	0.1	-	0.0	4	0.3
Boat shaped	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	1	0.1	-	0.0	1	0.1	1	0.1	-	0.0	2	0.2
Subtotal scrapers	1	**0.6**	-	**0.0**	-	**0.0**	-	**0.0**	4	**2.4**	1	**0.2**	15	**2.6**	16	**1.7**	19	**2.1**	6	**0.9**	50	**2.6**	15	**2.1**	26	**2.0**
Backed pieces:																										
Segments	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	2	0.2	1	0.1	1	0.1	-	0.0	3	0.2
Miscel.Bkd	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	2	0.2	7	0.8	2	0.3	8	0.4	1	0.1	10	0.8
Points/Blades	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	2	0.4	5	0.5	2	0.2	2	0.3	10	0.5	6	0.8	8	0.6
Subtotal backed	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**	2	**0.4**	7	**0.7**	11	**1.2**	5	**0.7**	19	**1.0**	7	**1.0**	21	**1.6**
Adzes	-	0.0	-	0.0	-	0.0	-	0.0	6	3.7	3	0.6	2	0.4	2	0.2	1	0.1	-	0.0	1	0.1	-	0.0	-	0.0
MRP	3	1.9	-	0.0	2	3.7	-	0.0	-	0.0	3	0.6	6	1.1	5	0.5	3	0.3	9	1.3	25	1.3	4	0.6	11	0.9
Borer/Drill	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	1	0.1	1	0.1	2	0.1	-	0.0	-	0.0
Unifacial Points	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal formal	4	**2.5**	-	**0.0**	2	**3.7**	-	**0.0**	10	**6.1**	7	**1.4**	25	**4.4**	30	**3.2**	35	**3.8**	21	**3.1**	97	**5.0**	26	**3.7**	58	**4.5**
TOTAL	159		47		54		98		164		488		571		936		921		86		1925		709		1293	

Table 7.2: Tortoise Cave formal tool inventory. MRP: miscellaneous retouched piece, UNIF. POINTS: unifacial points. Chronological divisions were established according to the distinction of three main episodes of occupation at Tortoise Cave (Chapter 4). For the description of formal tools see Manhire (1987).

PERIOD (yrs BP)	760-1800		3160-4020		4190-4330	
	n	%	n	%	n	%
SCRAPERS:						
convex	5	21.7	45	40.5	83	45.8
backed	1	4.3	9	8.1	5	2.8
boat shaped	-	0.0	2	1.8	3	1.6
Subtotal Scrapers	6	**26.0**	56	**50.4**	91	**50.2**
BACKED PIECES:						
segments	-	0.0	3	2.7	4	2.2
miscel.bkd	-	0.0	11	9.9	19	10.5
points/blades	-	0.0	11	9.9	24	13.2
Subtotal Backed	-	**0.0**	25	**22.5**	47	**25.9**
ADZES	9	**39.1**	5	**4.5**	1	**0.5**
MRP	8	**34.8**	23	**20.7**	40	**22.1**
BORER/DRILL	-	**0.0**	2	**1.8**	2	**1.1**
UNIF. POINTS	-	**0.0**	-	**0.0**	-	**0.0**
TOTAL FORMAL	23		111		181	
% formal		**2.2**		**4.4**		**4.6**

The category "other" comprises a heterogeneous group of lithic raw materials that do not fit the above rock classifications, and seldom constitute a large proportion of the total raw materials in most excavated sites. Basically, this category can be regarded as a measure of lack of detailed understanding on behalf of archaeologists of the fairly complex geology of the south western Cape. For this reason, any attempt to locate the sources of this category seems futile, unless individual types could be recognized with the help of a detailed geological survey program.

In summary, quartz and quartzite can be regarded as locally available, whilst silcrete is securely identified as a stone raw material exotic to both the Eland's Bay and Lambert's Bay areas.

LITHIC ARTEFACTS:

Flaked stone artefacts

As expected, the flaked stone artefact assemblages recovered from all three excavated sites follow the general characteristics of the Wilton industry as defined by J. Deacon (1984).

Stone tool frequencies:

At Tortoise Cave, frequencies of stone waste range between 94% and 86% of the total number of flaked stone artefacts (Table 7.1), and no marked changes are detected throughout the sequence except for slightly lower frequencies of waste in Layers 10 to 13a. The frequency of cores is variable within each episode of occupation, and overall, no consistent trends are detected through time for this category. In addition to this observation, bipolar and irregular cores are the most common type of core in Tortoise Cave (Table 7.1). Utilized pieces are also fairly variable from layer to layer, particularly in Layers 1a to 3b dating to the pottery period.

More definitive changes are observed in the formal tool category (Table 7.2). Though highly variable between 1a and 3b (Table 7.1), frequencies of formal tools drop from an average of 4.6% in the first episode of occupation (Layers 10 to 13a) and 4.4% in the talus occupation (Layers 5 to 8) to 2.2% during the pottery period occupation (Table 7.2). Most striking are the trends observed in the different formal tool categories (Table 7.2). Scrapers (50.4% to 50.2%) and backed pieces (22.5% to 25.9%) are the most frequent stone tool type between 3160 and 4330, whereas an increase in adzes (39.1%) and the total disappearance of backed pieces characterizes the pottery occupation at Tortoise Cave. This change in adze frequency, however,

Table 7.3: Summary data of flaked stone artefacts from Pancho's Kitchen Midden. MRP: miscellaneous retouched piece.

LAYER	1		2		3		4		5		6		7	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
WASTE:														
Chunks	27	17.0	22	18.5	42	17.3	63	18.6	35	17.2	34	19.4	177	28.6
Chips	76	47.8	64	53.8	123	50.6	156	46.0	83	40.9	58	33.1	206	33.3
Flakes	40	25.2	22	18.5	48	19.8	71	20.9	58	28.6	66	37.7	144	23.3
Blades	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	1	0.2
Bladelets	1	0.6	-	0.0	1	0.4	7	2.1	1	0.5	2	1.1	2	0.3
Subtotal waste	144	**90.6**	108	**90.8**	214	**88.1**	297	**87.6**	177	**87.2**	160	**91.4**	530	**85.8**
CORES:														
Bipolar	6	3.8	2	1.7	4	1.6	9	2.7	-	0.0	-	0.0	4	0.6
Bladelet	-	0.0	1	0.8	-	0.0	2	0.6	-	0.0	1	0.6	-	0.0
Irregular	-	0.0	-	0.0	2	0.8	1	0.3	1	0.5	2	1.1	16	2.6
Regular	-	0.0	-	0.0	1	0.4	1	0.3	1	0.5	-	0.0	3	0.5
Minimal	5	3.1	1	0.8	2	0.8	3	0.9	2	1.0	1	0.6	5	0.8
Subtotal cores	11	**6.9**	4	**3.4**	9	**3.7**	16	**4.7**	4	**2.0**	4	**2.3**	28	**4.5**
UTILISED PIECES	1	**0.6**	6	**5.0**	5	**2.1**	11	**3.2**	10	**4.9**	7	**4.0**	49	**7.9**
FORMAL TOOLS:														
Convex scrapers	1	0.6	-	0.0	8	3.3	9	2.7	5	2.5	1	0.6	6	1.0
Backed scraper	-	0.0	-	0.0	2	0.8	2	0.6	3	1.5	1	0.6	-	0.0
Boat shaped	-	0.0	-	0.0	-	0.0	-	0.0	1	0.5	-	0.0	-	0.0
Subtotal scrapers	1	**0.6**	-	**0.0**	10	**4.1**	11	**3.2**	9	**4.4**	**2**	**1.1**	6	**1.0**
Backed pieces:														
Segments	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Miscel.Bkd	-	0.0	-	0.0	-	0.0	-	0.0	2	1.0	-	0.0	3	0.5
Points/Blades	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal backed	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**	2	**1.0**	-	**0.0**	3	**0.5**
Adzes	1	0.6	1	0.8	4	1.6	2	0.6	1	0.5	1	0.6	1	0.2
MRP	1	0.6	-	0.0	1	0.4	2	0.6	-	0.0	1	0.6	1	0.2
Borer/Drill	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Unifacial Points	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal formal	3	**1.9**	1	**0.8**	15	**6.2**	15	**4.4**	12	**5.9**	4	**2.3**	11	**1.8**
TOTAL	159		119		243		339		203		175		618	

Table 7.4: Pancho's Kitchen Midden formal tool inventory. MRP: miscellaneous retouched piece, UNIF. POINTS: unifacial points. For the description of formal tools see Manhire (1987).

PERIOD (yrs BP)	570-880		2600		2900-3100		3600	
	n	%	n	%	n	%	n	%
SCRAPERS:								
convex	1	25.0	8	53.3	15	48.4	5	45.5
backed	-	0.0	2	13.3	6	19.4	1	9.1
boat shaped	-	0.0	-	0.0	1	3.2	-	0.0
Subtotal Scrapers	1	**25.0**	10	**66.7**	22	**71.0**	6	**54.5**
BACKED PIECES:								
segments	-	0.0	-	0.0	-	0.0	-	0.0
miscel.bkd	-	0.0	-	0.0	2	6.5	3	27.3
points/blades	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal Backed	-	**0.0**	-	**0.0**	2	**6.5**	3	**27.3**
ADZES	2	**50.0**	4	**26.7**	4	**12.9**	1	**9.1**
MRP	1	**25.0**	1	**6.7**	3	**9.7**	1	**9.1**
BORER/DRILL	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**
UNIF. POINTS	-	**0.0**	-	**0.0**	-	**0.0**	-	**0.0**
TOTAL FORMAL	4		15		31		11	
% formal		**1.4**		**6.2**		**4.3**		**1.8**

seemed to have been already underway during the 3160 to 4020 BP period. Adze frequencies increase to 4.5% around 3500 BP from 0.5% in the first episode of occupation (Table 7.2: 4190 - 4330 BP). Miscellaneous retouched pieces (MRP) become more common during the pottery period as well (34.8%), and, together with adzes and scrapers (26.0%) dominate the pottery period assemblage. It appears also that convex scrapers are the most common type of scraper throughout Tortoise Cave sequence, whilst miscellaneous backed pieces and point/blades are the most frequent categories of backed pieces.

Pancho's Kitchen Midden stone artefact assemblage is also dominated by stone waste (Table 7.3) with frequencies in a tight range between 85% and 91.4%. Core frequencies vary between 6.9% and 2.0%, in which those generated by the bipolar technique are most common in Layers 1 to 6, with irregular cores being markedly more dominant in Layer 7. No clear trends are evident in either waste or core categories throughout Pancho's Kitchen Midden.

Unlike the Tortoise Cave pattern, utilized pieces are generally more common at the beginning of Pancho's Kitchen Midden sequence (7.9% to 4.0%), dropping to lowest frequencies (3.2% to 0.6%) from Layers 4 to 1. The relatively high value of 5.0% for Layer 2 may be a reflection of the small sample size of this particular assemblage. Another marked trend is shown in the category of formal tools (Tables 7.3 and 7.4). Lowest frequencies of formal tools (1.4%) are again observed during the Pottery Period occupation (this time, Late Pottery) and highest values are recorded between 2600 and 3100 BP (6.2% and 4.3%, respectively). These high frequencies, however, are not reflected in the preceding and earliest occupation of Pancho's Kitchen Midden dating to *c.* 3600 BP, where only 1.8 % of the assemblage is comprised of formal tools (Table 7.4).

Perhaps the most impressive changes are observed in the formal stone tool composition (Table 7.4), although the relatively small sample size of the assemblage for the site as a whole needs to be recognized. In this case, signs for an increase in adze frequencies before 1800 BP are evident. Scrapers (54.5%) and backed pieces (27.3%) are the most common tools around 3600 BP, with adzes contributing only with a 9.1%. Subsequently, around 3000 BP, backed pieces are the least common stone tool (6.5%) with scrapers reaching highest frequencies (71.0%) in this sequence, and adzes showing a moderate increase to 12.9%. At 2600 BP, backed pieces are no longer present, and formal tools are dominated by scrapers (66.7%) and adzes (26.7%). The Late Pottery pattern, although represented by an extremely small assemblage, basically repeats the trends detected for the Early Pottery at Tortoise Cave, where adzes are the most common stone tool in the assemblage (Table 7.4).

Regarding the category of scrapers, those of convex and backed forms are the most frequent types throughout Pancho's Kitchen Midden sequence. Backed pieces are only represented by miscellaneous backed. Both scrapers and bladelet pieces are mostly made out of quartz. Adzes were predominantly shaped from silcrete flakes and a small proportion from CCS.

Steenbokfontein Cave stone artefact assemblage is dominated by lithic waste (Table 7.5), with values ranging between 84 % and 87 % in Layers 1 to 3 and slightly higher frequencies (around 90%) in Layer 4a and 4b. Core frequencies are relatively low from Layer 4b to Layer 2, with values ranging between 2.5% to nearly 4%, and marginally higher in Layer 1, where frequencies reach 6%. The most common type of core throughout Steenbokfontein Cave sequence is the bipolar, although a not insignificant increase in minimal cores shows up in Layers 1 and 2. Frequencies of utilized pieces are fairly similar from one layer to the next (between 5% and 7%), with the exception of Layer 4a, where frequencies reach a minimum of almost 3% (Table 7.5).

The formal tool category presents some contrasting numbers when Layers 4a and 4b are compared with deposits lying above. Frequencies of formal tools are consistently high (between 3.8% and 4.8%) in Layers 1 to 3, and somewhat low (2.1% and 2.2%) in Layers 4a and 4b, respectively (Table 7.5). Regarding formal tool types, scrapers (37.5%), MRP (31.2%) and backed pieces (18.7%) are the most common stone tools around 4000 - 6100 BP in Steenbokfontein Cave, with adzes contributing with lowest frequencies. Around 3500 - 3650 BP scrapers overwhelmingly dominate the assemblage (75.0%), with backed pieces (12.5%) as the second most common stone tool, and adzes (6.2%) as the most infrequent tool types. In sum, it appears that Layers 4a and 4b are mainly characterized by a scraper/backed piece stone tool assemblage. A subsequent shift to a scraper (51.0%)/adze (22.0%) dominated assemblage is shown in the 2200 - 2700 year old levels (Table 7.6), where MRP frequencies are also relatively high (20.2%), and backed pieces are present in low numbers (6.7%).

In the sub-categories of formal tools (Table 7.6) it seems that there is some indication of a change in scraper types after 2700 BP. This trend, however, is viewed with caution, as the relatively small size of the sample of formal tools in Layers 4a and 4b prevent a definitive statement. Overall, convex scrapers were the most common type of scraper between 6100 and

Table 7.5: Summary data of flaked stone artefacts from Steenbokfontein Cave. MRP: miscellaneous retouched piece.

LAYER	1		2		3		4a		4b	
	n	%	n	%	n	%	n	%	n	%
WASTE:										
Chunks	108	27.2	116	27.6	389	22.3	195	25.5	193	26.4
Chips	90	22.7	91	21.6	516	29.5	229	30.0	224	30.7
Flakes	134	33.8	146	34.7	597	34.2	262	34.3	232	31.8
Blades	-	0.0	-	0.0	1	0.1	-	0.0	-	0.0
Bladelets	3	0.8	2	0.5	19	1.1	10	1.3	7	1.0
Subtotal waste	335	**84.4**	355	**84.3**	1522	**87.1**	696	**91.1**	656	**89.9**
CORES:										
Bipolar	11	2.8	6	1.4	40	2.3	20	2.6	10	1.4
Bladelet	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Irregular	6	1.5	2	0.5	12	0.7	4	0.5	4	0.5
Regular	-	0.0	-	0.0	2	0.1	-	0.0	1	0.1
Minimal	7	1.8	7	1.7	11	0.6	6	0.8	3	0.4
Subtotal cores	24	**6.0**	15	**3.6**	65	**3.7**	30	**3.9**	18	**2.5**
UTILISED PIECES	21	**5.3**	31	**7.4**	93	**5.3**	22	**2.9**	40	**5.5**
FORMAL TOOLS:										
Convex scrapers	2	0.5	3	0.7	20	1.1	11	1.4	5	0.7
Backed scraper	-	0.0	2	0.6	1	0.1	-	0.0	-	0.0
Boat shaped	8	2.0	3	0.7	14	0.8	1	0.1	1	0.1
Subtotal scrapers	10	**2.5**	8	**1.9**	35	**2.0**	12	**1.6**	2	**0.8**
Backed pieces:										
Segments	-	0.0	-	0.0	-	0.0	2	0.3	1	0.1
Miscel.Bkd	1	0.3	1	0.2	5	0.3	-	0.0	2	0.3
Points/Blades	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal backed	1	**0.3**	1	**0.2**	5	**0.3**	2	**0.3**	3	**0.4**
Adzes	4	1.0	4	1.0	15	0.9	1	0.1	2	0.3
MRP	2	0.5	7	1.7	12	0.7	1	0.1	5	0.7
Borer/Drill	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Unifacial Points	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
Subtotal formal	17	**4.3**	20	**4.8**	67	**3.8**	16	**2.1**	16	**2.2**
TOTAL	397		421		1747		764		730	

Table 7.6: Steenbokfontein Cave formal tool inventory. MRP: miscellaneous retouched piece, UNIF. POINTS: unifacial points. For the description of formal tools see Manhire (1987).

PERIOD (yrs BP)	2200-2700		3500-3650		4000-6100	
	n	%	n	%	n	%
SCRAPERS:						
convex	25	24.0	11	68.7	5	31.2
backed	3	2.9	-	0.0	-	0.0
boat shaped	25	24.0	1	6.2	1	6.2
Subtotal Scrapers	53	**51.0**	12	**75.0**	6	**37.5**
BACKED PIECES:						
segments	-	0.0	2	12.5	1	6.2
Miscel.bkd	7	6.7	-	0.0	2	12.5
points/blades	-	0.0	-	0.0	-	0.0
Subtotal Backed	7	**6.7**	2	**12.5**	3	**18.7**
ADZES	23	**22.1**	1	**6.2**	2	**12.5**
MRP	21	**20.2**	1	**6.2**	5	**31.2**
BORER/DRILL	-	**0.0**	-	**0.0**	-	**0.0**
UNIF. POINTS	-	**0.0**	-	**0.0**	-	**0.0**
TOTAL FORMAL	104		16		16	
% formal		**4.1**		**2.1**		**2.2**

Table 7.7: Raw material composition of excavated stone artefacts at Tortoise Cave. CCS: cryptocrystalline silicates, for "OTHER" see text.

	QUARTZ		QUARTZITE		CCS		SILCRETE		HORNFELS		OTHER		TOTAL
LAYER	n	%	n	%	n	%	n	%	n	%	n	%	n
1A	125	78.6	5	3.1	6	3.8	19	11.9	3	1.9	1	0.6	159
1B	31	66.0	11	23.4	3	6.4	2	4.3	-	0.0	-	0.0	47
2A	43	79.6	4	7.4	4	7.4	3	5.6	-	0.0	-	0.0	54
2B	68	69.4	6	6.1	6	6.1	14	14.3	2	2.0	2	2.0	98
3A	124	75.6	8	4.9	7	4.3	22	13.4	3	1.8	-	0.0	164
3B	399	81.8	12	2.5	16	3.3	54	11.1	6	1.2	1	0.2	488
subtotal (760-1800 BP)	790	**78.2**	46	**4.5**	42	**4.1**	114	**11.3**	14	**1.4**	4	**0.4**	1010
5	455	79.7	9	1.6	12	2.1	90	15.8	2	0.4	3	0.5	571
6	779	83.2	12	1.3	14	1.5	118	12.6	7	0.7	6	0.6	936
7	615	66.8	12	1.3	16	1.7	270	29.3	3	0.3	5	0.5	921
8	522	75.8	22	3.2	11	1.6	125	18.1	5	0.7	4	0.6	689
subtotal (3160-4020 BP)	3728	**76.2**	88	**1.8**	75	**1.5**	948	**19.4**	24	**0.5**	25	**0.5**	4888
10	1111	57.7	57	3.0	17	0.9	728	37.8	7	0.4	5	0.3	1225
11	476	67.1	10	1.4	12	1.7	206	29.1	5	0.7	-	0.0	709
13A	826	61.5	42	3.1	6	0.4	461	34.3	5	0.4	3	0.2	1343
subtotal (4200-4330 BP)	2413	**60.7**	109	**2.7**	35	**0.9**	1395	**35.1**	17	**0.4**	8	**0.2**	3977
TOTAL	6931	**70.2**	243	**2.5**	152	**1.5**	2457	**24.9**	55	**0.5**	37	**0.4**	9875

Table 7.8: Raw material composition of excavated stone artefacts at Pancho's Kitchen Midden. CCS: cryptocrystalline silicates, for "OTHER" see text.

	QUARTZ		QUARTZITE		CCS		SILCRETE		HORNFELS		OTHER		TOTAL
LAYER	n	%	n	%	n	%	n	%	n	%	n	%	n
1	151	95.0	4	2.5	-	0.0	4	2.5	-	0.0	-	0.0	159
2	117	98.3	1	0.8	1	0.8	-	0.0	-	0.0	-	0.0	119
subtotal (520-880 BP)	268	**96.4**	5	**1.8**	1	**0.4**	4	**1.4**	-	**0.0**	-	**0.0**	278
3 (2600 BP)	227	**93.4**	5	**2.1**	-	**0.0**	10	**4.1**	-	**0.0**	1	**0.4**	243
4	296	87.3	19	5.6	2	0.6	20	5.9	-	0.0	2	0.6	339
5	180	88.7	15	7.4	5	2.5	2	1.0	-	0.0	1	0.5	203
6	127	72.6	40	22.9	5	2.9	2	1.1	-	0.0	1	0.6	175
subtotal (2900-3100 BP)	603	**84.1**	74	**10.3**	12	**1.7**	24	**3.3**	-	**0.0**	4	**0.6**	717
7 (3600 BP)	578	**93.5**	23	**3.7**	3	**0.5**	10	**1.6**	-	**0.0**	4	**0.6**	618
TOTAL	1676	**90.3**	107	**5.7**	16	**0.8**	48	**2.6**	-	**0.0**	9	**0.5**	1856

Table 7.9: Raw material composition of excavated stone artefacts at Steenbokfontein Cave. CCS: cryptocrystalline silicates, for "OTHER" see text.

	QUARTZ		QUARTZITE		CCS		SILCRETE		HORNFELS		OTHER		TOTAL
LAYER	n	%	n	%	n	%	n	%	n	%	n	%	n
1	270	68.0	89	22.4	11	2.8	20	5.0	1	0.3	6	1.5	397
2	232	55.1	145	34.4	6	1.4	30	7.1	1	0.2	7	1.7	421
3	1227	70.2	344	19.7	35	2.0	101	5.8	4	0.2	36	2.1	1747
subtotal (2200-2700 BP)	1729	**67.5**	578	**22.5**	52	**2.0**	151	**5.9**	6	**0.2**	49	**1.9**	2559
4a (3500-3650 BP)	651	**85.2**	87	**11.4**	7	**0.9**	9	**1.2**	1	**0.1**	9	**1.2**	764
4b (4000-6100 BP)	536	**73.4**	109	**14.9**	38	**5.2**	34	**4.7**	-	**0.0**	13	**1.8**	730
TOTAL	2916	**72.6**	774	**19.3**	97	**2.4**	194	**4.8**	7	**0.1**	71	**1.7**	4051

3500 BP (Layers 4a and 4b), and subsequently, between *c.* 3000 and 2200 BP scrapers were represented by equal numbers of convex and boat-shaped varieties. Segments, together with miscellaneous backed pieces, seem to comprise the backed piece component between 3500 and 6100 BP, whilst miscellaneous backed pieces only are represented in subsequent occupations.

Scrapers and backed pieces were mostly made of quartz throughout the mid and late-Holocene occupation of Steenbokfontein Cave, though silcrete was frequently used for adzes. In only a few instances CCS, hornfels and quartz were also used for making adzes; for example, both of the adzes present in Layer 4b were shaped from quartz.

Raw materials:

Quartz dominates the assemblage throughout Tortoise Cave sequence (Table 7.7), showing a marked increase in frequencies towards the more recent layers. This trend is consistent from one episode of occupation to the next (Table 7.7), and is also broadly reflected in the frequencies of quartzite, another locally available raw material. Silcrete, a raw material exotic to Eland's Bay and Lambert's Bay areas (see above) display an opposite trend, where frequencies decrease in successive occupations towards the pottery layers. It is important to remark that these changes in stone raw material usage predate the appearance of pottery and domestics in the area, and were already evident during the talus occupation between *c.* 4000 and *c.* 3200 BP (Table 7.7: Layers 5 to 8). CCS, hornfels and "other" contribute very small amounts to the total number of lithics in each episode of occupation. However, CCS was clearly more commonly used in the last 1800 years than before.

Overall, quartz also dominates the lithic assemblage at Pancho's Kitchen Midden (Table 7.8). A moderate increase in the use of silcrete is evident in Layers 3 and 4. These shifts, however, seem mostly related to fluctuations in the use of quartzite and CCS than to quartz, particularly in Layer 3 dating to *c.* 2600 BP. Hornfels is entirely absent from this assemblage (Table 7.8).

In Steenbokfontein Cave, quartz is the predominant raw material, but a fair amount of variation is nonetheless evident within Layers 1 to 3 (55.1% to 70.2%), as well as between Layers 4a and 4b and the rest (Table 7.9). Quartzite is the second ranked raw material in each stratigraphic layer. Its mineralogical characteristics make it almost indistinguishable from that of the cave walls and, consequently, an immediately local source is very likely. It also appears that quartzite contributes to the fluctuations in relative proportions of quartz. Inverse trends can be observed between these two stone raw materials, with highest frequencies of quartzite present in Layers 1 to 3 (particularly in Layer 2: 34.4%), and smallest ones (11.4%) in Layer 4a (Table 7.9). Although silcrete appears in small frequencies (between 1.2% and 5.9%), variations in the use of this exotic raw material seem to correlate inversely with those locally available, such as quartz and quartzite. CCS and "other" appear in very small quantities, but, overall, both are more common in Layers 1 to 3. Hornfels is infrequent in all excavated layers of Steenbokfontein Cave.

Non-flaked stone artefacts

Table 7.10 presents a list of various types of non-flaked stone tools recovered from Tortoise Cave. Most of these artefacts were made of local quartzite and quartz, and occasionally out of "other" raw material. Overall, Layers 1a to 3b seem to include a wider variety of these artefacts, as the categories of hammerstone/grindstone and palette/whetstone do not occur in Layers 5 to 8 at all, and the latter is also absent in Layers 10 to 13a. Similarly, pigment stained artefacts seem to constitute a greater proportion of non-flaked stone tools in Layers 1a to 3b. Regarding the different types of artefacts within this category, hammerstones and/or anvils are more frequent in Layers 5 to 8, and manuports in Layers 1a to 3b.

Pigments are mostly represented by iron oxide nodules (ochre) of different sizes and fragments thereof. Only a tiny proportion of pigment material is comprised of small lumps of specularite, all of which were recovered from Layers 2b and 3a. One case of laminated mica was encountered in Layer 7. More ochre is seen to occur in the levels dating to the late pottery period (Table 7.10: Layers 1a to 3b) when frequencies of pigments are compared to the number of non-flaked stone tools present in each episode of occupation. The same pattern holds true for Layers 1a to 3b, when frequencies of ochre are compared to that of flaked stone tools (Table 7.1).

Non-flaked stone tools and pigment recovered from Pancho's Kitchen Midden are listed in Table 7.11. The great majority of non-flaked tools were made from quartzite, and in a few cases also from quartz pebbles. The total number of worked stones excavated from this site is clearly very small. Nevertheless, it is possible to suggest that lowest frequencies are observed in Layers 1 to 3, all of which were excavated over five square meters, in contrast to Layers 4 to 7 excavated over an area of only three square meters. Non-flaked artefacts showing pigment staining are very rare at Pancho's Kitchen Midden.

Table 7.10: Raw frequencies of non-flaked stone artefacts and pigments recovered from Tortoise Cave (P = plain, S = stained with pigment).

LAYER	GRIND/ GROUNDST. P	S	HAMMERST./ ANVILS P	S	HAMMERST./ GRINSTONE P	S	PALETTES/ WHETST. P	S	MANUPORTS P	S	PIGMENT (grams)
1a	1	-	-	-	-	-	-	-	1	-	14.3
1b	-	-	1	-	-	-	1	-	-	-	4.6
2a	1	1	5	-	1	-	-	-	3	1	24.2
2b	-	-	-	-	1	-	1	-	4	-	28.7
3a	-	-	-	-	-	-	-	-	1	-	63.5
3b	1	1	2	-	-	-	-	-	1	-	# 564.3
subtotal	**3**	**2**	**8**	**-**	**2**	**-**	**2**	**-**	**10**	**1**	**699.6**
5	1	-	3	-	-	-	-	-	3	-	3.0
6	3	-	-	-	-	-	-	-	1	-	34.3
7	2	-	3	1	-	-	-	-	1	-	22.6
8	-	-	4	-	-	-	-	-	1	-	6.9
subtotal	**6**	**-**	**10**	**1**	**-**	**-**	**-**	**-**	**6**	**-**	**66.8**
10	1	-	-	-	-	1	-	-	-	-	17.3
11	1	-	1	-	-	-	-	-	* 3	-	27.7
13a	1	-	-	-	2	-	-	-	-	-	33.2
subtotal	**3**	**-**	**1**	**-**	**2**	**1**	**-**	**-**	**3**	**-**	**78.2**
TOTAL	16	3	19	1	4	1	2	-	19	1	844.6

: this observation includes a big piece weighing 523.1 grams
* : one bored stone is included in this count

Table 7.11: Raw frequencies of non-flaked stone artefacts and pigments recovered from Pancho's Kitchen Midden (P = plain, S = stained with pigment).

LAYER	GRIND/ GROUNDST. P	S	HAMMERST./ ANVILS P	S	HAMMERST./ GRINSTONE P	S	PALETTES/ WHETST. P	S	MANUPORTS P	S	PIGMENT (grams)
1	1	-	-	-	-	-	-	-	1	-	-
2	-	-	-	-	-	-	-	-	-	-	-
subtotal	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
4	-	3	-	-	-	-	-	-	1	-	0.8
5	1	-	1	-	-	-	-	-	-	-	2.3
6	-	-	-	-	-	-	-	-	1	-	1.5
subtotal	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**4.6**
7	**1**	**-**	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**6.5**
TOTAL	4	3	4	1	1	-	-	-	4	-	11.1

Table 7.12: Raw frequencies of non-flaked stone artefacts and pigments recovered from Steenbokfontein Cave (P = plain, S = stained with pigment).

LAYER	GRIND/ GROUNDST. P	GRIND/ GROUNDST. S	HAMMERST./ ANVILS P	HAMMERST./ ANVILS S	HAMMERST./ GRINSTONE P	HAMMERST./ GRINSTONE S	PALETTES/ WHETST. P	PALETTES/ WHETST. S	MANUPORTS P	MANUPORTS S	OCHRED STONES	OCHRED ROCKS	MISCELL.	PIGMENT (grams)
1	2	-	2	-	2	2	-	-	-	1	2	-	2	163.8
2	-	-	1	-	-	-	-	-	-	-	-	-	-	95.3
3	6	1	1	1	4	3	-	-	3	-	6	6	4	340.4
subtotal	**8**	**1**	**4**	**1**	**6**	**5**	**-**	**-**	**3**	**1**	**8**	**6**	**6**	**599.5**
4a	**2**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**56.7**
4b	**4**	**4**	**2**	**-**	**-**	**1**	**-**	**-**	**2**	**-**	**4**	**-**	**-**	**191.7**
TOTAL	14	5	7	1	6	7	-	-	6	1	12	8	7	847.9

Ochre nodules and flaky fragments of the same material comprise the entire category of pigment at Pancho's Kitchen Midden. Ochre seems absent from Layers 1 to 3, but is more frequent in Layer 7, when frequencies are compared against the total number of non-flaked tools. The same trend is also repeated when ochre frequencies are contrasted with those of flaked stone tools (Table 7.2).

A list including a variety of non-flaked stone artefacts and pigment recovered from Steenbokfontein Cave excavation is presented in Table 7.12. An overwhelming majority of non-flaked stone artefacts, excluding the category "miscellaneous", were made of quartzite chunks, cobbles and pebbles, with the exception of a single manuport in layer 4b consisting of a small quartz pebble.

The category "miscellaneous" comprises a few lumps of ferruginous sandstone, unmodified and naturally ochred quartz chunks, one small piece of quartz crystal with natural inclusions of ochre, and one nodule of calcrete, possibly collected from nearby Pleistocene fossil beaches. All these artefacts could certainly be classified as manuports. However, neither of the collections of manuports from Tortoise Cave and Pancho's Kitchen Midden included these types of finds. Consequently, it was decided that, rather than obscure their presence by quantifying them as manuports, it was more instructive to unveil the apparently greater diversity of non-flaked stone artefacts at Steenbokfontein Cave by establishing another grouping named "miscellaneous".

Marked differences in sample size from one layer to the next (Table 4.2 and Table 7.12) makes comparisons amongst assemblages difficult, and any trend detected should be regarded with caution. Consequently, presence or absence of certain types of artefacts between layers are emphasized in the following observations. An attempt is also made to compare the Steenbokfontein Cave assemblage (Table 7.12) to others previously described (Tables 7.10 and 7.11).

Palettes and whetstones are not present in the excavated material of Steenbokfontein Cave. Nevertheless, three other categories of non-flaked artefacts, which had not been observed for Tortoise Cave and Pancho's Kitchen Midden, were encountered. These new categories consist of ochred stones (< 385 cm^3), ochred rocks (> 385 cm^3) and "miscellaneous" (Table 7.12), of which the first two types of artefacts seem to be altogether more common in Layer 3 than in any other stratigraphic level. Also adding to the diversity of Steenbokfontein Cave

Table 7.13: Inventory of modified and worked marine shell, bone and wood as well as cordage from Tortoise Cave. Beads and ornaments are excluded.

LAYER	1A	1B	2A	2B	3A	3B	**1A-3B**	5	6	7	8	**5-8**	10	11	13A	**10-13A**
Donax scraper	6	3	5	8	3	2	**27**	3	2	2	5	**12**	-	-	1	**1**
Pointed bone	1	-	-	1	3	1	**6**	-	-	-	-	**-**	-	1	1	**2**
Bone spatula	1	-	-	1	1	-	**3**	-	-	-	-	**-**	-	-	-	**-**
Tortoise bowl (frag.)	1	-	-	1	-	-	**2**	-	-	-	-	**-**	-	-	-	**-**
Miscell. worked bone	2	-	1	2	2	-	**7**	-	-	-	-	**-**	-	2	1	**3**
Miscell. worked wood	5	-	2	1	-	-	**8**	-	-	-	-	**-**	-	-	-	**-**
Wood shavings	-	1	2	-	-	-	**3**	-	-	-	-	**-**	-	-	-	**-**
Twine/cordage #	5	-	-	-	1	-	**6**	-	-	-	-	**-**	-	-	-	**-**

= Includes a rolled up woven mat (± 110 mm long) in Layer 1A

Table 7.14: Inventory of modified and worked marine shell, bone and wood as well as cordage from Steenbokfontein Cave. Beads and ornaments are excluded.

LAYER	1	2	3	1-3	4A	4B
Donax scraper	-	-	-	-	-	5
Worked/util. shell	1	1	3	5	1	-
Pointed bone	-	-	-	-	-	1
Bone awl	1	1	-	2	1	1
Bone needles	-	-	2	2	-	-
Miscell. worked bone	-	2	2	4	1	-
Pointed wood	2	-	1	3	-	1
Miscell. worked wood	1	4	3	8	-	-
Wood shavings	13	15	13	41	-	-
Twine and cordage	5	-	27	32	1	-

Table 7.15: Inventory of worked and decorated ostrich eggshell (OES), and ornaments of different materials at Tortoise Cave.

LAYER	1A	1B	2A	2B	3A	3B	**1A-3B**	5	6	7	8	**5-8**	10	11	13A	**10-13A**
OES beads (complete)	35	20	15	49	102	137	**358**	33	26	21	10	**90**	16	30	8	**54**
OES beads (unfinished)	-	3	1	7	18	8	**37**	14	22	16	6	**56**	11	11	17	**39**
OES pendants	-	-	-	-	-	2	**2**	-	-	-	-	**-**	1	-	1	**2**
Miscell. worked OES	-	1	-	-	-	-	**1**	-	-	-	-	**-**	3	1	1	**5**
Decorated OES (frags)	-	-	-	-	-	-	**-**	-	-	1	-	**1**	4	-	2	**6**
OES water container rim	-	-	1	1	-	2	**4**	-	-	1	-	**1**	1	1	-	**2**
Ochred OES	7	-	16	128	6	-	**157**	-	-	-	-	**-**	1	-	-	**1**
Bone beads	-	-	1	3	1	1	**6**	-	-	-	-	**-**	-	1	-	**1**
Marine shell bead/pendant	1	-	1	4	13	3	**22**	-	1	1	-	**2**	-	-	1	**1**
Seed beads	2	-	-	-	1	-	**3**	-	-	-	-	**-**	-	-	-	**-**
Glass beads *	4	-	1	1	-	-	**6**	-	-	-	-	**-**	-	-	-	**-**
Copper bead *	1	-	-	-	-	-	**1**	-	-	-	-	**-**	-	-	-	**-**

* = Two more glass beads and a brass pendant was found on surface deposits immediately outside the shelter

Table 7.16: Inventory of worked and decorated ostrich eggshell (OES), and ornaments of different materials at Pancho's Kitchen Midden.

LAYER	1	2	1-2	3	4	5	6	4-6	7
OES beads (complete)	-	1	1	4	3	4	7	14	-
OES beads (unfinished)	-	-	-	-	-	-	-	-	2
OES pendants	-	-	-	-	1	-	-	1	1
Miscell. worked OES	-	-	-	-	-	-	-	-	-
Decorated OES (frags)	-	-	-	-	-	-	-	-	-
OES water container rim	-	-	-	-	-	-	-	-	-
Bone beads	-	-	-	-	-	2	-	2	-
Marine shell bead/pendant	-	-	-	-	-	-	-	-	-
Seed bead	-	-	-	-	-	-	-	-	-

Table 7.17: Inventory of worked and decorated ostrich eggshell (OES), and ornaments of different materials from Steenbokfontein Cave.

LAYER	1	2	3	1-3	4A	4B
OES beads (complete)	1	4	28	33	11	8
OES beads (unfinished)	2	4	17	23	2	8
OES pendants	-	-	2	2	1	-
Miscell. worked OES	-	-	-	-	1	-
Decorated OES (frags)	-	2	2	4	8	1
OES water container rim	-	-	1	1	1	1
Ochred OES	-	-	-	-	-	-
Bone bead/pendant	-	1	2	3	-	-
Marine shell bead/pendant	2	-	-	2	-	1
Decorated reed	-	-	1	1	-	-

Table 7.18: Incidence of pottery fragments in Tortoise Cave.

LAYER	number of observations
surface	3
1a	6
1b	1
2a	2
2b	5
3a	12
3b	2

Table 7.19: Incidence of pottery fragments in Pancho's Kitchen Midden.

LAYER	number of observations
surface	3
1	38

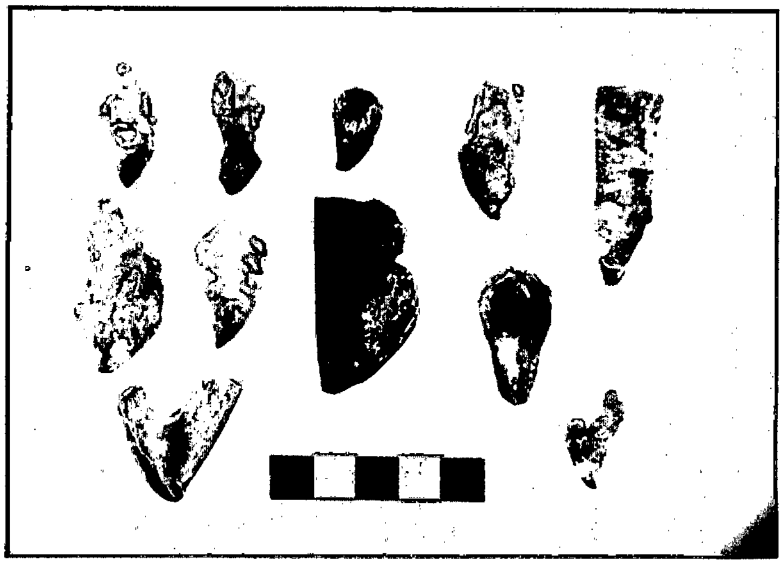

Figure 7.2: Selection of artefacts made from *Choromytilus meridionalis* shells.

assemblage of non-flaked stone artefacts are hammerstone/grindstones, which are substantially more common in this site than in Tortoise Cave and Pancho's Kitchen Midden (Tables 7.10 and 7.11). Layers 1 and 3, in particular, show relatively high frequencies of hammerstone/grindstones.

Pigments consist of variously sized pieces of iron oxide (hematite or red ochre) and psilomelane (general name for hard manganese oxides), many of which display marks of abrasion on their surfaces. Specularite was observed in only two instances, where one small lump was recovered from Layer 3 and a second one from Layer 4a. While not ignoring problems concerning uneven sample sizes between individual assemblages (see above), it appears that lowest frequencies of pigments are recorded in Layer 4a and 2, and highest in Layer 3 and, to same extent also, in Layers 4b and 1. These tentative observations are based on frequency comparisons of pigments against other stone artefacts listed in Table 7.12. The same trends are observed when frequency of pigments are contrasted with flaked stone counts (Table 7.5).

NON-LITHIC ARTEFACTS

The inventories of non-lithic material culture include a wide variety of artefacts, most of which consist of ornaments and tools made of various organic materials, as well as ceramic fragments, resinous objects and other items of more enigmatic character and material composition. Observations on rock art are briefly included in this section.

Following cautionary remarks regarding the early definition and function of bone points (Smith & Poggenpoel 1988; Hall 1990: 166) a distinction is made here between 'bone points' and 'pointed bone'. Whilst bone points can be clearly identified as part of San arrow projectiles by comparison with ethnographic material, pointed bones show a more informal manufacture and irregular surface, as well as less care in the termination. Thin and smoothly worked lengths of bone, found broken with the remaining part missing, were also classified as pointed bones, as their inclusion in the category of bone point cannot be guarantied.

The categories of miscellaneous worked bone and wood comprise pieces showing clear evidence of having been utilized in some way (e.g: cut, notched, bevelled, ground, pierced) and fire sticks. The miscellaneous worked ostrich eggshell (OES) category includes fragments that were modified in similar fashions (see above), and a few other cases. The latter are exemplified by pieces where the edges were worn smoothly into the shape of a disk or polygon, but are not bead blanks and show no other feature that could help the observer to determine their use.

Cordage, shell, bone and wood tools:

The list of non-lithic tools and other artefacts made of shell, bone and plant fibre recovered from Tortoise Cave is presented in Table 7.13. As one might expect, most of these artefacts were encountered in the relatively well preserved deposits dating to the last 2000 years. Donax scrapers (shell implements) appear to be the most common of all non-lithic tools throughout Tortoise Cave sequence. Besides Donax scrapers, pointed bones [identified as 'bone points' by Robey (1984)] and miscellaneous worked bone, the rest of the categories listed in Table 7.13 are only present in Layers 1a to 3b. One fire stick was encountered in Layer 2a. Photographs of these artefacts are to be found in Robey (1984).

Worked bone is marginally represented at Pancho's Kitchen Midden by two small fragments that fall within the category of "miscellaneous" as defined above. No worked wood or cordage was found during excavations at this site. Shell tools were mostly recovered from Layer 1, consisting of twelve whole and robust *Patella barbara* shells displaying clear wear marks on the anterior margin (Fig. 7.1). These wear marks were not observed in any other position on the shells. Most of them are striations parallel to the long axis of the shell. Smoothly worn surfaces are also present in addition to, and sometimes in the absence of, such striations.

Another type of worked shell was also encountered throughout Pancho's Kitchen Midden sequence. In this instance, *Choromytilus meridionalis* shell fragments show evidence of piercing, notching and edge modification as the most frequent type of use wear and preparation. Their characterization as worked shells is more difficult to ascertain than in the case of the *P. barbara* shells (see above) because of the high degree of shell fragmentation and unaccounted taphonomic processes which might generate similar wear features. Nevertheless, a few convincing examples have been identified (Fig. 7.2), but their final quantification and possible significance still awaits more analysis. No evidence for the use of Donax scrapers at Pancho's Kitchen Midden was found.

At Steenbokfontein Cave, the number of different types of non-lithic tools and artefacts are greater than in any other site analysed (Table 7. 14). Bone awls, bone needles and pointed wood sticks are categories exclusive to Steenbokfontein Cave. Nonetheless, bone spatula and tortoise carapace bowl fragments have not yet been recovered from this site, but do occur in Tortoise Cave.

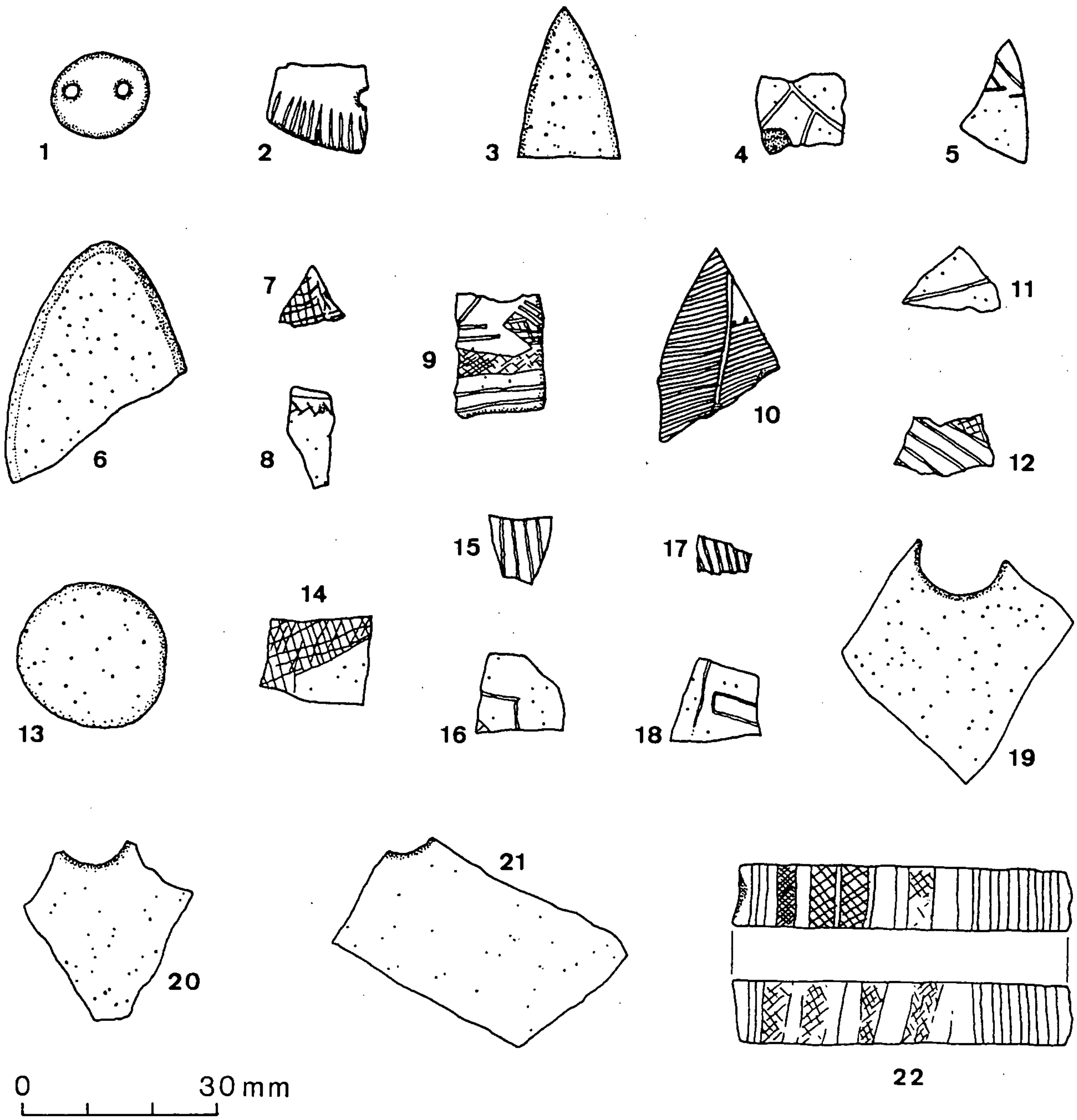

Figure 7.3: Illustrations of worked ostrich eggshell (OES) and plant material. OES pendants from Pancho's Kitchen Midden: 1 (Layer (L) 7), 2 (L 4); worked OES from Steenbokfontein Cave (SBF): 3 (L 3), 6 (L 3), 13 (L 4a); decorated OES from SBF: 4 and 5 (L 2), 7 (L 4b), 8 and 9 (L 3), 10, 11 and 12, 14, 15, 16, 17 and 18 (L 4a); OES water container mouths from SBF: 19 (L 3), 20 (L 4a), 21 (L 4b). Decorated reed tube from SBF: 22 (L 3).

Donax scrapers and pointed bone were only found in Layer 4b, whilst bone needles, miscellaneous worked wood and wood shavings were only found in the 3000 - 2000 BP year old basin deposits (Layers 1 to 3). Worked and/or utilized shell consist of three perforated black mussel shell fragments (Layers 1, 3 and 4a), a black mussel valve split along its length and showing evidence of utilization (perhaps as a spatula) on the posterior and naturally sharper edge (Layer 3), and one whole *Patella compressa* shell (also found in Layer 3) with the edges ground smoothly, possibly used as a container of some sort.

The category of miscellaneous worked bone includes a highly fragmented pelvis from a medium to large bovid (Layer 4a) showing extensive use of ochre on one surface. Amongst various miscellaneous worked wood items, one fire stick was encountered in Layer 2, one piece of knotted grass was found in Layer 3, and another piece of knotted grass was recovered from the burial pit of a human neonate.

One remarkable feature of Steenbokfontein Cave plant fibre objects is their abundance, which is certainly greater than the whole of Tortoise Cave (Table 7. 13) and Eland's Bay Cave (J. Parkington pers. comm.) taken together. The recovered cordage from Steenbokfontein Cave amounts to a total of 30 pieces or 1055 mm of fine twine, and another 3 pieces of thick twine comprising 265 mm of fibrous material. In one instance a knot joins two thin pieces of twine (Layer 3), and in another four cases (Layers 1 and 3) the knot had been formed on single lengths of string. All cordage material was manufactured out of two twisted threads of fibre.

Worked OES and ornaments

Worked OES and ornaments (Table 7.15) seem to be distributed more regularly throughout Tortoise Cave sequence than are the non-lithic tools. Nevertheless, OES pendants, miscellaneous worked OES, ochred OES and bone beads are all absent from the talus excavation (Layers 5 to 8). Seed beads are also not encountered in these deposits, and nor are they present in the older ones (Layers 10 to 13a).

Glass and copper beads as well as a brass pendant were only recovered from post 2000 BP deposits (Layers 1a to 2b), as is to be expected from their recent introduction into southern Africa (Miller & Webley 1994; Saitowitz *et al.* 1996). Interestingly, the only item that is exclusively represented in the pre-pottery deposits consists of decorated OES fragments, two of which are also part of water container rims. OES water container rims are, nonetheless, present throughout Tortoise Cave sequence, including the pottery period deposits. Hence, the absence of

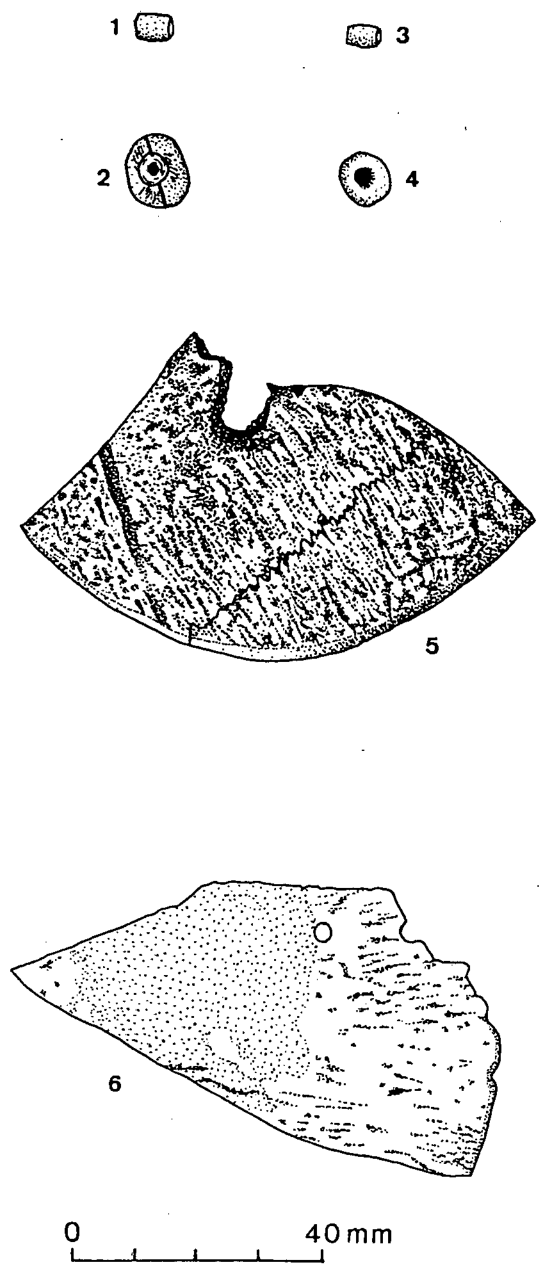

Figure 7.4: Illustrations of decorative worked bone. Bone bead and pendant from Pancho's Kitchen Midden: 1 and 2 (Layer (L) 5; bone bead and pendant from Steenbokfontein Cave (SBF): 3 (L 2), 4 (L 3); pieces of worked bone (possibly fragments of a pectoral plate) from SBF: 5 and 6 (L 3), (ochre staining is shown by stippling).

decorated pieces is not due to the absence of OES water containers in the most recent layers. This pattern seems to be repeated in the sequence of Eland's Bay Cave (J. Parkington pers. comm.), and in some of the excavated sites of the interior mountains (Anderson 1991).

Another apparent contrast between the pre-pottery layers and those post-dating them is indicated by the ratio between the number of beads and pendants made of OES fragments against those made from other materials, such as bone, shell, glass and metal. In this instance, relatively more beads and pendants were made of materials other than OES during the pottery period (ratio = 9.5), whilst the reverse pattern seems to have been the norm during the preceding period (ratio = 45.0 for Layers 5 to 8, ratio = 28.0 for layers 10 to 13a). This contrast holds when glass and metal ornaments are excluded from the calculations. A photographic record of Tortoise Cave ornaments is found in Robey (1984).

In contrast to Tortoise Cave, the range of worked OES and ornament types recovered from Pancho's Kitchen Midden is restricted to beads and pendants (Table 7.16). Moreover, with the exception of one OES bead in Layer 2, the overwhelming majority of these objects were found in the pre-pottery deposits (Table 7.15; Figs 7.3 and 7.4).

The inventory of worked OES and ornaments from Steenbokfontein Cave (Table 7.17) includes a similar range and types of artefacts as those from Tortoise Cave. Of all the stratigraphic levels, Layer 3 exhibits the greatest range of such items, although this might be a reflection of the relatively large volumes of material excavated from these deposits (Table 4.2). Also in Layer 3, a richly decorated reed tube was found in an excellent state of preservation (Fig. 7.3). This is certainly a unique archaeological finding from the western Cape.

With the exception of Layer 1, decorated OES fragments are present throughout Steenbokfontein Cave sequence (Fig. 7.3). It is important to note that a significant number of decorated OES fragments were recovered from the highly calcined deposits of Layer 4a, from which the smallest volumes of material were excavated (Table 4.2). The only example of miscellaneous worked OES was also found in Layer 4a and consists of a small and burnt OES disk (Fig. 7.3).

The single bone pendant so far observed at this site is represented by two semi-concave pieces of bone, with the preserved edges and surface ground smoothly (Fig. 7.4). Both show evidence of ochre staining and perforation. Although speculative, these remains might have been part of an object used as a pectoral plate.

Pottery:

The incidence of ceramic fragments in Tortoise Cave is very low (Table 7.18), consisting of a total of three surface potsherds, twenty-eight fragments in stratigraphic context, and another four fragments in "mixed" layers or out of context. The great majority of these pieces are black in colour and a few are brown, red or grey. All fragments are adiagnostic and fairly small, the biggest of which reaches the maximum dimension of 75 x 75 mm. The thickness of these potsherds varies substantially between 5.5 and 12.5 mm. The clay was made of a coarse admixture, where quartz and sand were used as temper. No decorated potsherds were found, and only two fragments were part of rims. One of the rims is plain and rounded, the other one is overturned and rounded (for a prototype, see J. Rudner 1968: 617).

All pottery fragments so far recovered from Pancho's Kitchen Midden were found on the surface of the excavated squares and in Layer 1 (Table 7.19). The colour of the pottery is brown or reddish brown, and in only a few instances is black tarnish evident. None of the potsherds show diagnostic features. Their width ranges between 5.2 to 6.4 mm. The size of the largest piece is approximately 40 x 30 mm. The clay material is coarse grained, with quartz used as temper. Three decorated potsherds were found but no rims. Two of the decorated fragments, however, seem to have originated from very close to their respective rims. The decorative pattern in these two cases consists of a row of circular impressions along an incised and straight line (for a prototype, see J. Rudner 1968: 618-619), and a single incised line next to a broken edge. The third decoration exhibits three semi-parallel grooved lines.

One plain and tapered rim sherd and another ceramic fragment were found during the excavations at Steenbokfontein Cave. Both of these pieces are adiagnostic, and are relatively thin (4.3 and 4.5 mm) when compared to the collections described above. Their surface colour varies from dark brown to grey and red. The clay material consists of a medium to fine admixture (for the definition of different admixtures, see J. Rudner 1968: 449), with quartz and sand used as temper. These finds were recovered from Layer 2 (square K4) and Layer 3 (square K5) dating, respectively, to *c.* 2400 BP and *c.* 2500 BP. These dates are considerably older than the age that is generally accepted for the introduction of ceramics into southernmost Africa, around 2000 BP (Sealy & Yates 1994). Consequently, both of these sherds are regarded as intrusive until further evidence proves otherwise.

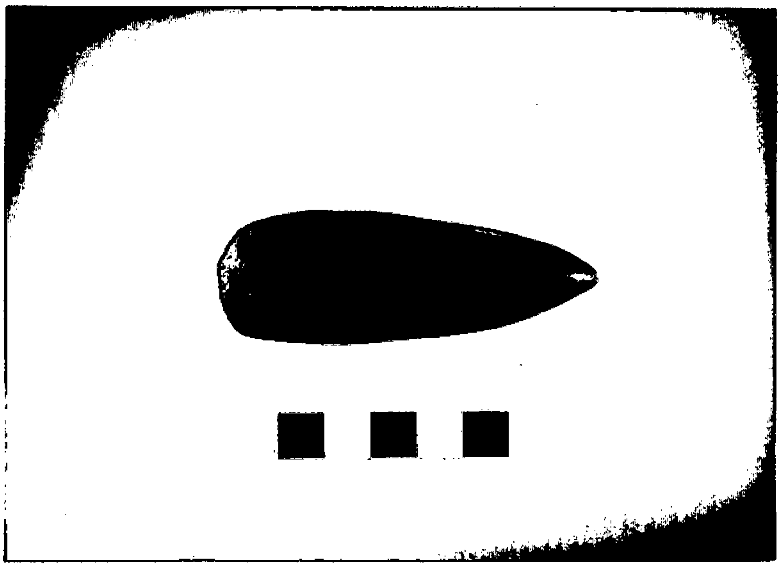

Figure 7.5: Resinous object recovered from Steenbokfontein Cave (Layer 1).

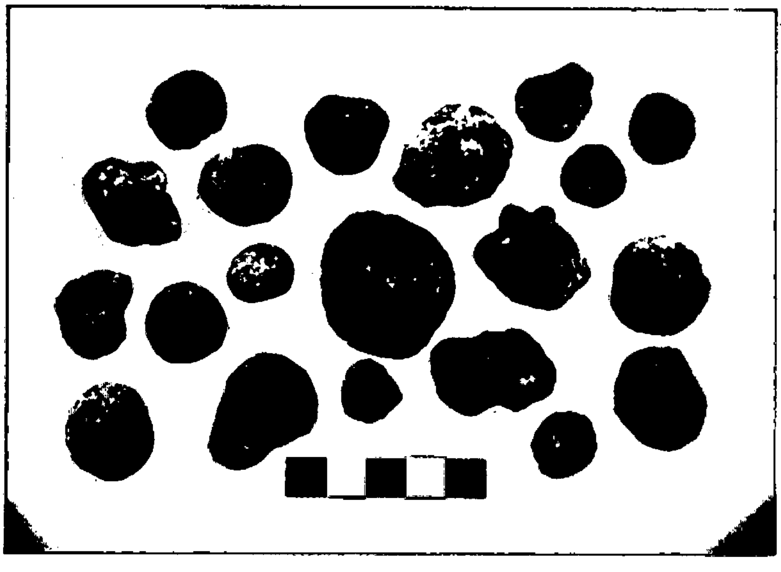

Figure 7.6: Nodules from Steenbokfontein Cave recovered from a small and shallow basin in Layer 4b.

Resinous objects:

Two small lumps of mastic with red ochre staining were recovered from Tortoise Cave excavations. Unfortunately, both came from section cleanings, and therefore their age and associations are uncertain.

No trace of mastic remains were observed in Pancho's Kitchen Midden deposits, but two resinous objects were found in clear stratigraphic context at Steenbokfontein Cave. Both were recovered from Layer 1. One is an amorphous lump of resin, and the other is a curated object. This latter object is 80.1 mm long and resembles the shape of a cone or thick cigar (Fig. 7.5). In cross section it has the form of an irregular oval (maximum diameter = 28.0 mm) and weighs 43.0 g. One end shows evidence of work, perhaps the marks left after heating and subsequent applications of mastic onto other artefacts (Fig. 7.5). Ochre staining is extensive on the surface, and three finger impressions can be observed perpendicular to the length of the object and in proximity to the utilized end. This object is certainly unique in the west coast archaeological record.

Other finds:

Two types of finds are grouped in this category, both of which were present only in Steenbokfontein Cave. The one consists of amorphous lumps of sand and possibly pigment material. In many instances, broken ends show a dark red or brown coloured matrix, and in other cases the matrix is very dark, almost black. In these latter cases, the matrix contains a glittering component. A total of eleven "lumps" were recovered, all of them from Layer 4b. It is likely that such pieces were collected from natural sources for their pigment content.

The other type of find consists of relatively small aggregates of sandy material shaped into semi-irregular spheres or oval "nodules". The maximum diameter of these objects ranges between 11.0 and 32.1 mm, and a few of them show finger press marks from their manufacture (Fig. 7.6). Thirty one such objects were found in a small basin (approximately 250 mm in diameter and 70 mm deep) situated 150 mm below a shell lens dated to *c.* 4000 BP (Layer 4b). Another fifteen nodules were found in stratigraphic units immediately adjacent to and beneath this small basin. It is very likely that all of the nodules were made and purposefully placed in the small basin, perhaps as a kind of cache. This feature was subsequently disturbed in one of the edges during the removal of deposit that lead to the creation of the second and major basin dated to between 3000 and 2000 years BP (Figs 4.7 and 4.9). Preliminary analyses on the admixture used in their manufacture identified aeolian sand grains as the main component, small amounts of red pigment, and a third as yet unidentified colloidal material (Miller pers. comm.). These results confirm initial observations of these nodules being the result of human manufacture, as no natural occurrences match their description and composition. Further analyses are needed in order to properly ascertain the composition of these unique finds.

Rock art:

Neither Tortoise Cave nor Pancho's Kitchen Midden show any trace of rock art, but several rock paintings are found in Steenbokfontein Cave. Most of these consist of hand prints, human figures and there are at least two images of fat tailed sheep. The latter images are the first depictions of domestic animals recorded for the west coast, and are an exception to a previously described pattern in their geographic distribution (Yates *et al.* 1994). Several painted rock spall derived from the wall of the cave were found as part of a rock fall in Layer 4a. The painted spalls were found at a depth of 35 cm below the surface, and its inclusion into the deposits happened around 3600 BP. Two matching slabs show paintings consisting of at least six red human figures with white lines and rows of dots around ankles and knees of two figures. Another human figure seems to have a white kaross covering its torso. These painted slabs constitute the oldest securely dated examples of parietal art in South Africa (Yates & Jerardino 1996).

DISCUSSION

The relatively small sample size of each of the stone artefact assemblages presented in this chapter needs to be recognized. Nevertheless, the fact that all three show broadly the same trends through time, particularly in the category of formal tools, can be taken as an indication of their being representative of a stone tool sequence at a regional level.

Stone tool frequencies through time

In both Tortoise Cave and Pancho's Kitchen Midden, the percentage of formal tools decreases in the pottery period, a trend that has been also observed from other sites containing pre- and post-2000 BP material in the western Cape (Manhire 1993; Schweitzer & Wilson 1982; Yates *et al.* 1994). This drop in formal tool frequencies, however, was not always evident

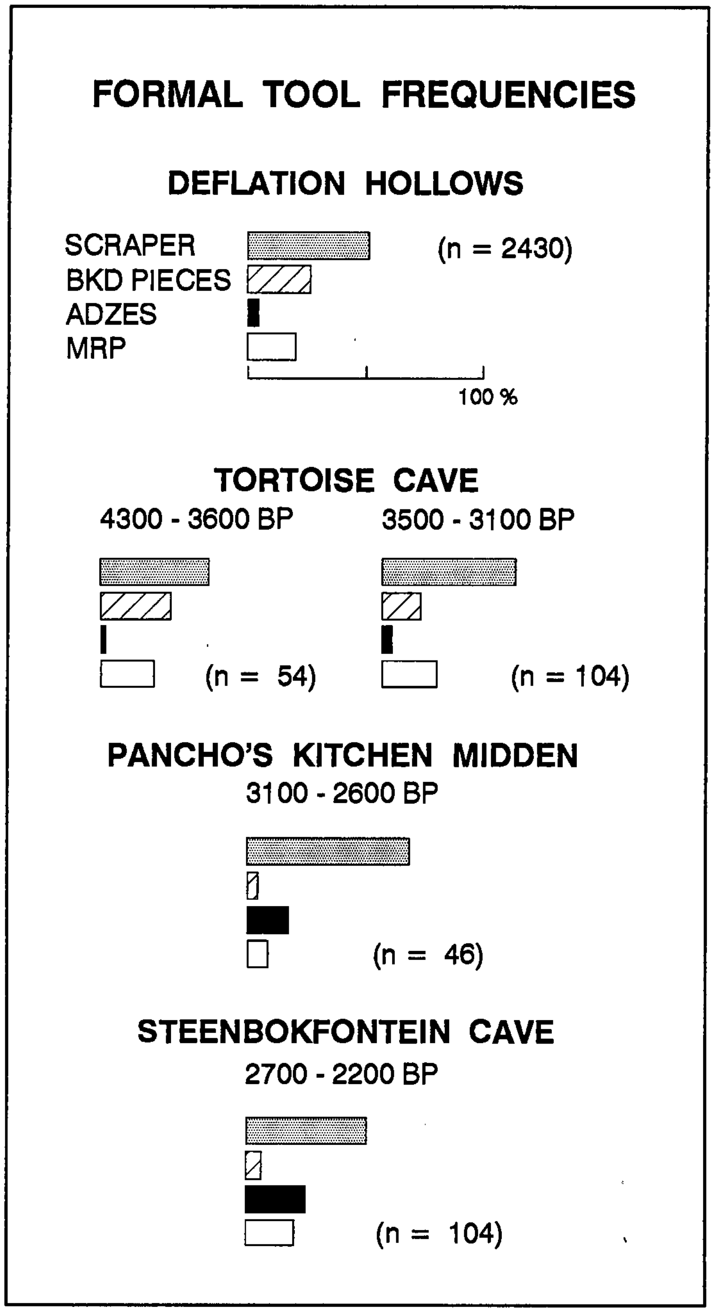

Figure 7.7: Formal tool frequencies from sites located in the research area Observations from deflation hollows were obtained from Manhire (1984: Appendix 10). MRP: miscellaneous retouched pieces.

throughout this landscape (Smith *et al.* 1991; Yates pers. comm.). Nevertheless, in those instances where it appears to have taken place, this change seem to have been very pronounced. Formal tools dating to between 3000 and 2000 BP make up to 6.2% and 4.1% (Tables 7.4 and 7.6) of the stone artefact assemblages. These frequencies are in sharp contrast with those of 2.2% and 1.4% (Table 7.2 and 7.4), as well as those below these values (Webley 1992; Yates *et al.* 1994), of assemblages dating to the last 2000 years.

A shift towards an increase in the degree of expediency in stone artefact assemblages is also not a phenomenon exclusive to many of the Pottery Period occupations. Some of the Holocene sequences in the western Cape (Robertshaw 1977), southern and eastern Cape (J. Deacon 1984; Hall 1990) show instances where frequencies of formal tools fluctuate considerably sometime before 2000 BP. In these sequences, however, drops in the percentage of formal tools are generally not as pronounced as those observed for the Pottery Period. This seems to have happened also at Pancho's Kitchen Midden and Steenbokfontein Cave, where formal tools dating to 3500 BP and older appear in frequencies (1.8% to 2.2%) comparable to those observed for the pottery period at Tortoise Cave (2.2%) and Pancho's Kitchen Midden (1.4%). It is possible that these values could be a reflection of the high degree of variability inherent in small sample sizes, such as those excavated from both of these sites. Alternatively, these low percentages might be an indication for changes in short-term risk management (Torrence 1989) and/or shifts in settlement patterns (Parry & Kelly 1987). Whatever the explanation for the low incidence of formal tools in pre-pottery occupations of Steenbokfontein Cave and Pancho's Kitchen Midden might be, sample sizes for both of these assemblages will have to be increased by undertaking further excavations.

The results shown in Tables 7.2, 7.4 and 7.6 provide the means for a resynthesis of the local sequence of changes in stone tool preferences and, by extension, to the coastal settlement history in the research area over the last 4300 years. Tortoise Cave assemblages show that adzes started to assume marginally greater importance in stone tool production by about 3500 BP. Subsequently, between 3000 and 2000 BP, adzes became the second most frequent stone tool after scrapers as evidenced by megamidden period assemblages in Pancho's Kitchen Midden and Steenbokfontein Cave. These observations confirm at the coast what was revealed by Nackerdien (1989) and Manhire (1993) in the Cape Fold Belt mountains to the east, where adze frequencies increase between 3500 and 2500 BP. Furthermore, these results conform to a pattern of increase in adze frequencies also noted in the southern most part of the western Cape

(Schweitzer & Wilson 1982), and represent a departure from earlier views for the western Cape (Parkington *et al.* 1986).

Another aspect of this trend is the progressive decline in backed pieces (particularly segments) from the local archaeological record over the last 4300 years. In fact, the time trend of backed piece frequencies is the inverse of that observed for adzes (Fig. 7.7). Backed tools are most common between 4330 and 3500 BP, becoming substantially less frequent during the megamidden period and, in at least the assemblages discussed here, they subsequently disappear completely within the last 2000 years. This later absence or dramatic decrease in the frequency of backed tools was also previously observed (Manhire 1984, 1987; Manhire *et al.* 1984). The period when relatively high frequencies of backed pieces are found might extend back to the mid Holocene, as suggested by the small assemblage of Layer 4b in Steenbokfontein Cave dated to *c.* 6100 BP (Fig. 4.9). Such a scenario can be expected on the basis of the high frequencies of segments and other backed pieces in mid-Holocene assemblages from the south and south eastern coast (J. Deacon 1984; Hall 1990). The significance of mid-Holocene visits to the deflation hollows, however, will only be clarified with the analysis of a substantially larger stone tool assemblage, built up as a consequence of further excavations.

Adzes have been functionally related to wood working, such as the maintenance of wooden artefacts (e.g. digging sticks, bows and pegs) (Clark 1958; Parkington 1980; Mazel & Parkington 1981). These initial speculations were later confirmed by Binneman (1984) and Binneman & Deacon (1986) via experimentation and microwear analysis. Consequently, the marked increase in adze frequency from *c.* 3000 BP onwards might well have been the result of greater demands for the manufacture and maintenance of digging sticks, amongst other wooden artefacts (Parkington *et al.* 1986). The fairly abundant underground plant remains present in the 3000 - 2000 year old deposits in Steenbokfontein Cave support this suggestion. Preparation of windbreaks and wooden domestic structures for the settlement in the open space during the dispersal phase over the megamidden period (Chapter 6) might also have increased the demand for the production of adzes. Manufacture and maintenance of bows, however, seems not to have been part of this effort, as faunal evidence for hunting appears in diminished quantities by the time adze frequencies were on the rise around 3000 BP (Jerardino & Yates 1996; Chapter 8). Moreover, if segments and backed pieces were part of stone arrow heads as suggested by Wadley (1989: 43), then their low frequency after 3000 years BP could also be related to a drop in hunting.

A few years ago, the chronology provided by Tortoise Cave had (and still has) direct implications for the dating of the vast collections of stone artefacts present in deflation hollows (Figs 4.1 and 4.2), which dot the margins of the rivers and coastal lakes of the Sandveld (Parkington *et al.* 1986; Manhire 1987). Characterized by a dominance of scrapers and backed pieces (Manhire 1987), deflation hollows appeared by reference to Tortoise Cave to date to between 4300 and 3000 BP. In the absence of viable stone tool assemblages dating to the 3000 to 2000 BP period, the types of assemblages from 4300 to 3000 BP were considered to be representative of the megamidden period as well. Without evidence to the contrary, it seemed "reasonable" to hypothesize that the deflation hollows represented sites contemporary with the large megamiddens (Parkington *et al.* 1986; Parkington 1991). Both these types of sites reflected an episode in which open air settlement was preferred after more than a millenium of apparently preferential cave and rock shelter occupation. Furthermore, the richness of the deflation hollow stone tool assemblages provided an apparent complement to the paucity of such remains in the megamidden themselves. This view of the deflation hollows as contemporary with the megamiddens is now seriously challenged by the present evidence.

Figure 7.7 shows a summary of the formal tool frequencies from eleven deflation hollows (Manhire 1984: Appendix 10), and dated assemblages of pre-pottery age. Based on the degree of similarity between the stone tool profile of the deflation hollows and those displayed by the rest, the former sites can be securely associated with a period of time between 4300 BP and possibly no later than 3000 BP. Whilst some human presence in the deflation hollows between 3000 to 2000 years ago cannot be discounted, these assemblages cannot reflect palimpsests of *equal* mixture of 3000 to 2000 BP assemblages present at Pancho's Kitchen Midden and Steenbokfontein Cave and those of the type found in 4300 to 3500 BP deposits present in Tortoise Cave. Consequently, the *predominant* formal tool signature of deflation hollows dates to before 3000 BP.

Following the above argument, it is suggested that the largest trace of human settlement in the 4300 to 3500 BP period is that in the deflation hollows set somewhat back from the coast. Subsequently, settlement started to shift to the coast and nearby areas around 3600 - 3400 BP (Chapter 6), and, later on, human activity was concentrated at locations situated along rocky platforms and immediate surroundings. During this latter period, not only was shellfish gathering emphasized as never before in the Holocene, but it seems also that a greater amount of effort was dedicated to underground plant collection, as reflected by the increase in adzes after 3000 BP.

Stone raw materials and settlement patterns

Stone raw material composition also has implications for the reconstruction of settlement and mobility patterns over the last 4300 years. A clear trend of decreasing use of exotic silcrete in favour of locally available stone raw materials (quartz and quartzite) can be observed from Tortoise Cave results (Table 7.7). Pancho's Kitchen Midden shows that already by the time it was first occupied around 3600 BP, quartz and quartzite were the preferred stone raw materials (Table 7.8).

At Steenbokfontein Cave, silcrete was never abundant (Table 7.9), particularly *c.* 3600 BP, at a time when Tortoise Cave data shows decreasing, but nonetheless moderately high frequencies of silcrete. The low incidence of silcrete at Steenbokfontein Cave might be related to the longer distance from this site to any presently known source of silcrete (see above). Distances from sites in the Eland's Bay area to the nearest source of silcrete are much shorter. Perhaps also relevant to consider here is the often fuzzy nature of frequency observations resulting from small sample sizes, such as that of Layer 4a in Steenbokfontein Cave.

In nearby deflation hollows, however, where frequency calculations are based on very robust numbers, raw materials show an almost identical profile to that in Tortoise Cave at 4000 - 4300 BP [quartz (59.0%), quartzite (3.6%), CCS (2.9%), silcrete (33.4%), hornfels (0.5%), and "other" (0.6%), n = 23 766; based on Manhire (1984): Appendices 7 - 10]. On the one hand, these observations confirm the suggestion that deflation hollows date to before 3000 BP according to Tortoise Cave sequence. On the other hand, it points to Steenbokfontein Cave as an exception amongst pre-3000 BP sites in the area, where frequencies of silcrete are the lowest.

This, however, seems not to be the case, as observations on the stone raw material composition of Doorspring midden, located 15 km north of Steenbokfontein Cave (Fig. 4.2), seems to suggest a different scenario. At Doorspring silcrete dominates with 73.6% over quartz (24.3%) in layer 4 which has been recently dated to 5130 BP (Table 4.1). Such a high abundance of silcrete is exceptional, as no other site in the research area has produced frequencies anywhere close to these. This pattern is reversed in Layer 3 in Doorspring, dated to 4090 BP (Table 4.1), where silcrete contributes only 7.2%, and quartz becomes the most abundant raw material (91.5%) in the assemblage. Quartz continues to dominate in Layers 1 and 2, the latter deposit dating most probably to the megamidden period (Kaplan 1994). Hence, it appears that north of Wadrifsoutpan, the decrease in the use of silcrete for stone tool production took place earlier than was the case to the south. Silcrete frequencies were already low by *c.* 4000 BP in the Lambert's Bay area, taking at least another 1000 years to reach lowest values in the Eland's Bay area.

Overall, trends in the use of stone raw materials in the research area over the last 4300 years consist of an increase in the use of locally available raw materials (quartz and quartzite) at the expense of the exotic lithic component (silcrete). Although quartz is the dominant raw material in the research area throughout this period, this lithic material started to be more frequently used in the last 3500 years. Silcrete, on the other hand, was more marginally used from 3000 BP onwards. These changes are interpreted as a reflection of an increasing restriction of hunter-gatherer mobility to the coastal strip and adjacent Sandveld after 3500 BP and until well after the introduction of the pastoralist economy to the western Cape. This interpretation is consistent with the reconstruction of the local formal stone tool sequence, changes in the spatial (geographical) distribution of dated sites at about the same time, (Chapter 6), and concomitant increase in the intensity of site usage (Jerardino 1995; Chapter 6).

It is important to note that whilst quartz was becoming more and more frequently used, the greater demands on the manufacture of adzes also put demands on the acquisition of silcrete, the material from which adzes are often made. As silcrete became increasingly difficult to obtain, people might have had to resort to alternative methods for its procurement, such as collecting silcrete cores and chunks from surface scatters from older and abandoned sites [see Kaplan (1987) and Anderson (1991) for a similar suggestion offered for the Pottery Period and pre 3000 BP assemblages]. Although interesting, this hypothetical scenario should be tested with more observations on a larger sample of adzes.

Function of sites and aggregation at Steenbokfontein Cave

Overall, it seems that the same range of domestic activities were performed at Tortoise Cave, Pancho's Kitchen Midden and Steenbokfontein Cave, as reflected by broadly the same variety of stone artefacts recovered from each of these sites. Nevertheless, the emphasis of these activities seem to have shifted from site to site and through time. This observation is not only supported by changes in relative frequencies within the different categories of lithic artefacts, but also by the evidence for activities other than of domestic character at one site and not at others.

Frequencies of non-flaked stone artefacts in Tortoise Cave and Pancho's Kitchen Midden are generally lower than in Steenbokfontein Cave (excluding ochred stones and rocks and miscellaneous, see Table 7.12) during pre-pottery occupations when compared against frequencies of flaked stone artefacts. This observation might reflect a greater emphasis on plant food processing at Steenbokfontein Cave than at the other two sites. Additionally, the category of hammerstone/grindstone is more common at Steenbokfontein Cave in Layer 3 than at Tortoise Cave and Pancho's Kitchen Midden altogether. This observation might be related to the evidence for relatively longer occupations by larger and diverse groups of people at Steenbokfontein Cave during the accumulation of Layer 3 (Chapter 6). The use and re-use of beach and river cobbles for a variety of purposes (e.g. plant processing, stone artefact manufacture and pigment pounding) might be a reflection of the multi-task activities often displayed during occupations of the character determined for Layer 3 (Yellen 1977). A greater demand of work involving different purposes (subsistence, social and ritual) are usually part of aggregation phases (Lee 1979), which are suggested to have occurred repeatedly during the accumulation of Layer 3 (Chapter 6).

On the other hand, frequency comparison of non-flaked stone artefacts against flaked stone artefacts during the pottery period seems to suggest more plant food and, perhaps, pigment processing (due to the presence of palettes, whetstones and quantities of ochre) at Tortoise Cave than at Pancho's Kitchen Midden. It is possible that this difference might by related to changes in time, since pottery occupations in Tortoise Cave date mostly to before 1000 years BP and Pancho's Kitchen Midden dates to after 1000 years BP.

When these comparisons are established diachronically, a progressive increase in the representation of non-flaked stone artefacts in Tortoise Cave can be observed through time. The opposite trend seems to be the case in Pancho's Kitchen Midden sequence, where relatively more grinding equipment was provided during occupations dating to between 3100 and 2600 BP. At Steenbokfontein Cave, there seem not to be a consistent trend, but rather a fluctuating one. Grinding equipment and hammerstones were more regularly used between *c.* 6100 and 4000 BP, and between *c.* 3000 and 2500 BP as well as around 2200 BP. Overall, it appears that plant food processing was more frequently undertaken at Steenbokfontein Cave during pre-2000 BP visits than at Tortoise Cave and Pancho's Kitchen Midden, and that this activity was also emphasised during the first part of the megamidden period.

In Chapter 6, it was suggested that Steenbokfontein Cave was regarded as an aggregation site by hunter-gatherer groups during part of the megamidden period, and perhaps also around 3500 BP. It was also suggested that intense social life and ritual were the central and main purposes of these gatherings, and that increasing levels of social stress during the megamidden period were mediated through these activities. From all the activities that were part of these gregarious occasions, several of them should be possible to trace in the archaeological record because of their qualitatively distinct character from those during the dispersal phase of hunter-gatherer groups (Wadley 1987). There are several examples of hunter-gatherer behaviour in which their material expression can be differentiated from others without much difficulty. Amongst the incumbent here are: body decoration with pigments as part of the individual's preparation for dances and rituals (I. Rudner 1982: 214-232), the occurrence of long lasting communal dances and healing rituals around fires (Guenther 1975/76; Katz 1982), and the exchange of gifts during marriage brokering and reinforcement of social networks and obligations (Marshall 1976; Lee 1979; Wiessner 1982). Thus, a higher incidence of gift items, evidence for repetitive and/or substantial fires and a higher frequency of pigment use and pigment stained objects are expected to be encountered as the material manifestations of highly ritualized aggregation phases amongst hunter-gatherers. Pigment material such as ochre could have been used during prehistory for purposes other than ritual. Nevertheless, ethnographic observations and rock art studies, particularly within the context of southern Africa, indicate that the use of red pigments was frequently and closely related to ritual (Silberbauer 1981: 151; I. Rudner 1982, 1983).

The material record for the use of pigment and pigment stained objects is quite different from site to site and through time. Excavations at Pancho's Kitchen Midden produced only a few grams of ochre, and ochre stained stone artefacts such as grindstones and/or hammerstones constitute only a small proportion of the non-flaked stone tool assemblage (Table 7.11). Likewise, Tortoise Cave ochre stained stone artefacts are very infrequent overall, but ochre nodules and fragments of them are relatively more common in those layers dating to after 2000 BP.

In sharp contrast with these observations are those gathered from the excavated deposits of Steenbokfontein Cave (Table 7.12). Ochre stained grindstones and/or hammerstones are generally more common at this site than at Tortoise Cave and Pancho's Kitchen Midden. Moreover, two categories of stone artefacts showing evidence of extensive pigment staining (ochred stones and rocks) are present in Steenbokfontein Cave and not in the other two sites. A third category of non-flaked stone artefact, that is also not present in either of Tortoise Cave and Pancho's Kitchen Midden consists mostly of ferruginous sandstone lumps and ocherous quartz chunks that could well have been collected for their pigment content. Many of them were recovered from Layer 3. Furthermore, a pelvis fragment from a large bovid showing extensive use of pigment on its surface was found in Layer 4a. When considering all categories of ochre stained stone artefacts and nodules of pigment (Table 7.12), it appears that greater use was made of pigments during occupations of Layer 3 than was the case before or after. That visits to Steenbokfontein Cave between *c.* 3000 and 2500 BP had a significant ritual component is further highlighted by the presence of rock paintings in this cave, some of which date to before 3000 BP (Yates & Jerardino 1996). The significance of rock art in magico-religious as well as ritual aspects of precolonial hunter-gatherers of southern Africa has been well established over the last twenty years of rock art research (Vinnicombe 1976; Lewis-Williams 1981, 1982, 1986; Yates *et al.* 1990). Hence, the presence of paintings would have provided an important attraction for rituals to take place at Steenbokfontein Cave.

Evidence for repeated and/or long lasting fires are certainly difficult to trace in deposits lacking the protection against the elements given by large overhangs and caves. Nevertheless, remnants of a few hearths or clearly defined ash lenses are present in Pancho's Kitchen Midden and Tortoise Cave talus, respectively (Chapter 4). It could be argued that these features are only a small proportion that survived the destructive effects of successive rains, wind and trampling. This could certainly be the case if evidence for repeated and/or long lasting fires could only be derived from the features mentioned above. In the context of shell midden deposits, archaeologists should also expect to encounter shell and bone burned to different degrees, as well as rocks showing intense heat stress as part of the evidence for the making of fires.

None of the shell and bone samples recovered from Tortoise Cave talus and Pancho's Kitchen Midden show evidence for burning, and nor do the rocks and non-flaked stone artefacts from these two contexts show any sign of substantial stress from heat. Observations from Steenbokfontein Cave are at variance with these accounts. Heavily burnt shell remains and charred bones were found amongst dark ash bodies in Layer 3 (Chapter 4), and not in other levels, with the exception of Layer 4a (see below). Furthermore, a number of rocks showing signs of extreme heat stress on their surfaces, including cracks and changes in the crystal matrix, were found in association with hearth features and between these. Several of these rocks had also been rubbed with red pigment (Table 7.12: ochred rocks).

Layer 4a also shows a similar combination of characteristics. In this case, the entirety of the shell and bone remains are calcined, and because of this very few hearth-like features could be distinguished from the rest of the deposit of Layer 4a. Surprisingly, none of the ochred rocks and non-flaked stone artefacts found in Layer 4a show heat stress features like those in Layer 3, but several examples of naturally glazed stone artefacts were observed during laboratory analyses. Noting the considerable depth of Layer 4a deposits (Fig. 4.9), it seems that the near total calcination of its contents must have taken place during or after repeated occupations and not during a single event. It is likely that the extreme burning of these deposits was the result of unattended fires, which smouldered on after the cessation of activities in the cave. In sum, both Layer 3 and 4a show evidence of repeated and/or intense fires during the occupation of Steenbokfontein Cave over the last 6000 years.

Now we turn to the evidence regarding non-lithic artefacts. The great majority of the objects passed on from one person to another as presents amongst southern African hunter-gatherer groups comprise items for body decoration, parts of hunting and gathering equipment, skins, articles of clothing made from different materials, and also a variety of artefacts and materials for their daily use (Marshall 1976: 303-311; Silberbauer 1981: 237-242; Wiessner 1982). Certainly, skilfully and beautifully decorated objects are greatly appreciated as presents. Unfortunately, many of the gift items that are made of organic materials (e.g. leather, plant fibre and wood) do not preserve particularly well in archaeological contexts. Consequently, the different preservation of organic remains between the sites discussed here has to be taken into account when establishing comparisons regarding the frequency with which these objects are encountered from site to site. Therefore, the presence and frequency of objects made of more durable materials, such as OES, bone, shell and stone, are the focus of the following analysis and discussion.

No shell beads or pendants and very few pieces of worked bone and OES were recovered from Pancho's Kitchen Midden. Of these few artefacts, none were decorated. It seems highly unlikely that specially prepared gift items were brought to this site for their exchange, or as material expressions of friendship, as well as for creating and reinforcing social networks. Likewise, it is also improbable that this site was targeted for communal and long lasting ritual activities. Rather, it seems that the site function of Pancho's Kitchen Midden was mainly that of a campsite where domestic activities were performed by a group of people who had access to the nearby reef of Mussel Point. Whilst an important component of their subsistence strategy was undertaken at this productive reef and nearby dune area (Mike Taylor's Midden), other activities related to family and social life, typical of the "dispersal phase" (Lee 1979; Silberbauer 1981; Wiessner 1982), characterized settlement at Pancho's Kitchen Midden.

In Tortoise Cave, a fair amount of beads and pendants was found. Many of these were made of shell material that is presently available only south of the Berg River mouth (Fig. 1.1) and around the south coast. Decorated OES pendants, decorated OES fragments and a variety of worked bone were also recovered during excavations (Tables 7.13 and 7.15). When quantities of these particular items are compared to those of stone artefacts and fauna (Appendix 2) for each episode of occupation, a substantial number are found in the youngest layers within the cave and very few in the talus deposits. Thus, although the large size of the visiting groups during the accumulation of the talus deposits (Chapter 6) could well have been an expression of special communal gatherings at Tortoise Cave, most of the activities undertaken at this site between 4000 and 3100 BP appear instead to have been of domestic character. These would have consisted of hunting and gathering in the near vicinity, food processing and cooking, stone artefact manufacture and the making of OES beads during people's (women's ?) free time. Surely many other tasks were also undertaken, but, unfortunately, these are not clearly reflected in the archaeological record.

Most of the gift-type items in Tortoise Cave are found in the deposits dating to the early Pottery Period. Whether or not Tortoise Cave was an aggregation site in the research area during a few centuries after 2000 BP can only be answered by comparing its contents and associations to that of other sites with contemporary occupations. Eland's Bay Cave is the single other site known to have been visited more or less at the same time as Tortoise Cave around 1700 BP (Table 4.1). This sole comparison is probably not enough to clarify the character of the visits to each of these sites. It would not be until at least one or two more sites with deposits dating to this particular period are excavated and analysed that archaeologists will be able to answer this question.

When the quantities of gift-type items made out of relatively durable materials (Tables 7.14 and 7.17) are compared to the amount of stone artefacts and fauna (Appendix 2) for each layer of Steenbokfontein Cave, only Layer 1 shows a relatively small proportion of them. When the same comparison is established including those objects made out of wood and plant fibre (excluding wood shavings), Layer 3 ranks as the one presenting a relatively high proportion of them amongst the other excavated layers. Obviously, Layer 4a is not included in this new comparison because of the lack of organic preservation in these deposits. Nonetheless, it is possible that gifts made out of wood and plant fibre were also originally part of Layer 4a artefact assemblage.

According to the criteria for recognizing aggregation phases in the archaeological record proposed by Wadley (1987, 1989), Layer 3 of Steenbokfontein Cave does match the expectations regarding a higher formalization of tool kits, relative abundance of gift items of different sorts, and the presence of objects and/or materials with magico-religous significance, such as pigment nodules and evidence for pigment use. But on the other hand, Layer 3 does not show a greater diversity of stone raw materials than the rest of the layers, nor are segments or backed pieces one of the most abundant stone tool types. In fact, segments have not yet been found in Layer 3. Hall (1990: 193-194) has already shown that "...high segment frequencies provide no simple index of aggregation" in the context of the late-Holocene archaeology of the eastern Cape region. This caution seems also applicable to at least part of the western Cape. The diversity of stone raw materials at Steenbokfontein Cave appears also to be a reflection of the degree of openness of social networks (and hence mobility) rather than an indication for the use of a site as an aggregation or dispersal locale. Furthermore, aggregation at Steenbokfontein Cave involved the participation of a number of family groups that had access to broadly the same range of stone raw materials, due to reduced hunter-gatherer mobility at that time. Hence, although the archaeological signatures for aggregation and dispersal can be derived from a core of observations (site features, intensity of site use, and changes in contents), other characteristics, such as frequency of segments and diversity of stone raw materials, seem to be relevant mostly to those cases discussed by Wadley (1987, 1989).

In sum, the site function of Steenbokfontein Cave seems likely to have changed through time. When this large cave was not used mainly as a living site, people visited it specifically for ritual purposes, gift and information exchange, as well as for active socializing and networking. As a consequence of these large communal gatherings (which would have also involved, necessarily, a substantial amount of domestic work), rising levels of social stress and conflict due to increasing population densities in the area were resolved or diminished. Furthermore, as a result of the repetition of these gatherings at Steenbokfontein Cave over a number of generations, this place (and possibly the whole kopje) is likely to have become imbued with powerful social metaphors that would have been reinforced over a couple of centuries, or perhaps for longer. The special meaning of this place might also have taken root in peoples minds and, perhaps, cosmology. In a similar case regarding the southern /Xam San, J. Deacon (1988: 129) concluded that this society "...may not have given significance to every landscape feature, [but] they certainly attached importance to some landmarks and incorporated them into their beliefs, rituals, and folklore". Such a suggestion seem to find also support in one of Grevenbroek's accounts (Schapera 1933: 195) of indigenous customs at the Cape of Good Hope. In this account, people were described as performing a particular set of movements and gestures when approaching a place that they regarded as special to them.

The special purpose visits to Steenbokfontein Cave might have been already in practice around 3500 BP, but it is more likely that these occurred between *c.* 3000 and 2500 BP. During subsequent occupations dating to between 2400 and 2200 BP, hunter-gatherer aggregation and ritual intensification seem not to have been the principal motive for visiting this place, as inferred from the evidence presented in this section. Unless these occasions took place at another site, the near cessation of them at Steenbokfontein Cave might be an indication that ritual and trance dances, gift-giving and the reinforcement of appropriate behaviour through them were no longer effective for mediating conflict and coping with stress. Changes in settlement patterns were also underway after 2400 BP (Chapter 6). These consisted of a change in the definition of a living place, and the opening of new sites in the periphery of the study area and/or a more intense use of those that were already located there. Altogether, these changes seem to reflect the reformulation of strategies designed to cope with the increasing levels of stress that were felt towards the end of the megamidden period.

SUMMARY:

Local changes in material culture through time and space are closely linked to demographic changes in the research area. The shift from a scraper-backed piece to scraper-adze dominated assemblage around 3000 BP coincides with a relocation of settlement from the Sandveld riverine environment to the coastal strip and immediately adjacent areas. The resulting increase in population densities between 3000 and 2000 BP reoriented subsistence strategies, and encouraged an increased demand for certain types of stone tools, such as adzes. As mobility became increasingly restricted to the coast along a north-south axis, the manufacture of stone artefacts had to be undertaken with a less diverse range of stone raw materials, of which quartz and quartzite were the most dominant.

Local variations in the lithic and non-lithic artefact assemblages between sites seem also to reflect differences in site function. These differences are also supported by observations derived from site formation processes and the presence of particular site features. Inter-assemblage variability points to Steenbokfontein Cave as an important aggregation site between *c.* 3000 and 2500 BP, and perhaps during previous centuries as well. Visits to this site were specifically scheduled for ritual and social purposes, which were the principal activities through which increasing levels of social stress and potential conflict were mediated. After 2400 BP, Steenbokfontein Cave was no longer the center-place of meaningful socio-religious significance, but some importance might have been still attached to this former landmark after this date. Small as it is, the evidence available for the late megamidden period suggests that ritualized gatherings were no longer effective in coping with increasingly stressful conditions after 2400 BP.

The material changes that were brought about as a consequence of the arrival of the pastoralist economy in the western Cape consisted of a more expedient manufacture of stone artefact assemblages, although this was not always the case. Also during the last two millennia, adzes reached higher frequencies than ever before, and ceramics (potsherds) were added to the repertoire of hunter-gatherer material culture. The fact that the diversity of stone raw materials after 2000 BP was dominated by locally available lithic materials seems to suggest that mobility continued to be circumscribed within fairly localized areas. From the work of Yates (in prep.), it is also possible to suggest that changes in the expression of group identity was another and important manifestation of the socio-political readjustments rising from the addition of pastoralism (and its particular ideology) to the already existing web of social relationships and codes of behaviour amongst hunter-gatherer groups. At a local scale, these changes might have involved the start and also the demise of some decorative traditions, such as the choice for a greater diversity in body ornamentation and the cessation of the practice of decorating OES water containers, respectively.

CHAPTER 8

SUBSISTENCE

INTRODUCTION:

The reconstruction of subsistence patterns in the south western Cape has received considerable attention from archaeologists over nearly 20 years (Parkington 1972, 1976, 1977, 1981; Parkington & Poggenpoel 1971; Robey 1984, 1987; Sealy 1986, 1989; Klein & Cruz-Uribe 1987; Buchanan 1987, 1988; Sealy & Van der Merwe 1985, 1986, 1988; Parkington *et al.* 1988; Lee-Thorp *et al.* 1989; Jerardino & Parkington 1993; Henshilwood *et al.* 1994; Jerardino & Yates 1996). In particular, assessments regarding subsistence resource mix (the predominance of either marine or terrestrial resources in hunter-gatherer diet) have had direct relevance in the reconstruction of settlement patterns and mobility (Parkington 1972, 1976, 1977, 1981; Sealy 1986, 1989; Sealy & Van der Merwe 1985, 1986, 1988; Parkington *et al.* 1988; Henshilwood *et al.* 1994; Jerardino & Yates 1996).

A new attempt to characterize the dietary mix from sites in the research area is a response to several new considerations, such as: i) a different interpretative framework adopted in this thesis project (Chapter 2), ii) an increasing number of sites excavated over the last few years (Chapter 4), and iii) the recognition of the inadequacy of dietary comparisons based on energy yields (calories or kilojoules) of food remains present in shell middens, which had been used earlier to infer diet and residencial permanence (Buchanan 1987, 1988; Henshilwood *et al.* 1994: 108). Indeed, calories are no longer the best currency for comparison in such contexts, as shellfish seems to have been of more importance as a source of protein rather than energy, except for periods just prior to their reproduction season (Erlandson 1988; Glassow & Wilcoxon 1988; Noli & Avery 1988; Chapter 4). Moreover, unknown taphonomic processes, unverifiable assumptions, and inadequate sampling contribute to the generation of great margins of error in the calculations of energy yields (Waselkov 1987: 140-142, 166; Sampson 1988), thus raising additional doubts regarding the use of this method.

Recent dietary reconstructions based on estimates of meat and protein yields (Erlandson 1994) are also not the best to follow. As recognized by Erlandson, this method is subject to a variety of sampling and, particularly, conversion errors, and resulting figures have to be regarded as tentative and provisional. A detailed assessment of the dietary mix expressed in <u>absolute</u> numbers is not the objective of this chapter. Instead, a method conducive to the identification of

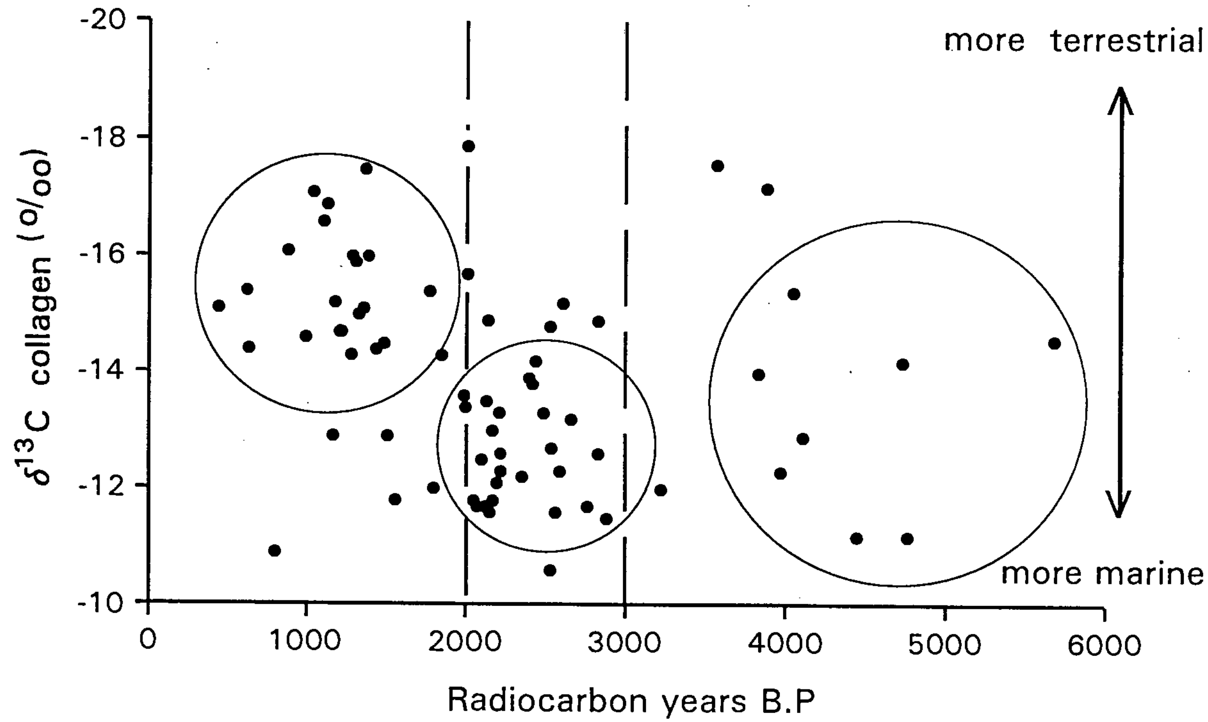

Figure 8.1: Stable carbon isotope values of coastal skeletons found between Eland's Bay and the Cape Peninsula (after Sealy [1989]).

the relative importance of one category of resources over another is preferred here. The point is not whether hunter-gatherers consumed more calories, protein or grams of meat from terrestrial species than from marine organisms or *vice versa*. The question is whether or not any significant emphasis was placed on the consumption of any particular type of resources over others through time, even though one source might always have been dominant in absolute terms. Further questions regarding the main sources of protein and energy have to be answered by complementing this sort of evidence with available isotopic data, the meaning of which has yet to be understood properly (Parkington 1987b; Lee-Thorp *et al.* 1989; Ambrose & Norr 1993).

Changes in the subsistence resource mix through time and its significance for coastal hunter-gatherer groups is the most important issue addressed in this chapter. For this purpose, observations on dietary remains of Tortoise Cave, Pancho's Kitchen Midden, Steenbokfontein Cave, and several megamiddens will be presented. These results are subsequently compared to previous palaeodietary reconstructions (Parkington 1976, 1977, 1981; Sealy & Van der Merwe 1985, 1986, 1988; Parkington *et al.* 1988; Henshilwood *et al.* 1994) and discussed within the wider archaeological context already addressed in previous chapters.

PREVIOUS DIETARY RECONSTRUCTIONS: METHODS AND OBSERVATIONS

Before presenting the results of the analysis on dietary remains, it is important to summarize previous assessments of hunter-gatherer resource mix in the south western Cape. Such an account is needed in order to justify the way the evidence is presented in this chapter and also to highlight its relevance for proper evaluation in the discussion section.

Initial assessments of hunter-gatherer subsistence in the south western Cape proposed an approximately equal mix of marine and terrestrial resources in people's diet. This hypothesis was based on the assumption that hunter-gatherer movements in the landscape were "... determined in large part by the distribution and availability of resources, both food and raw materials" (Parkington 1981: 431). The suggestion of an homogeneous mix of marine and terrestrial diet was arrived at after a substantial amount of archaeological evidence for hunter-gatherer seasonal movements between coast and interior mountain was identified (Parkington 1972, 1976, 1977, 1981).

Subsequent isotope analyses on human skeletons buried at the west coast between the Cape Peninsula and Eland's Bay (Figs 1.1 and 8.1) suggested an unequal mix of food stuffs in peoples' diet through time. In particular, the isotopic evidence showed an increase in marine food intake during the megamidden period (Sealy 1989; Sealy & Van der Merwe 1988). Following this observation, it was suggested that the lifestyle of coastal dwellers during this particular period was characterized by a permanent or semi-permanent settlement pattern at the coast.

Criticisms followed, suggesting that carbon isotope readings on bone collagen probably reflect the protein source and not of the diet as a whole (Kruger & Sullivan 1984; Parkington 1987b). These criticisms prompted further isotopic assessments. Carbon isotope analyses were conducted on samples of biological apatite obtained from the same skeletal material analysed by Sealy (1989) (Fig. 8.1). In this study (Lee-Thorp *et al.* 1989) it was assumed that carbon isotope ratios of bone apatite largely reflected the source of energy-rich foods (fats and carbohydrates). Based on the resulting isotopic readings, it was suggested that during the megamidden period prehistoric diet included substantial amounts of marine protein as well as energy-rich foods of both marine and terrestrial origin. For the last 2000 years, the diet included a greater proportion of protein and carbohydrates of terrestrial origin (Lee-Thorp *et al.* 1989). Basically, these results supported the conclusions of Sealy & Van der Merwe (1988) regarding prehistoric settlement patterns.

These two divergent reconstructions, each based on different kinds of observations (archaeological and archaeometrical), have been difficult to reconcile, and a number of criticisms concerning the respective methodologies, definitions and assumptions have been made (Sealy 1986; Parkington 1986, 1991; Sealy & Van der Merwe 1992). Nevertheless, both sides have agreed on an integration of bioarchaeological and archaeometric analyses (Parkington 1987b; Sealy & Van der Merwe 1987), towards which this thesis is a contribution. Previous attempts to make sense of both sets of observations have revolved around a pilot study of strontium isotope ratios (Sealy *et al.* 1991) and the proposition of metabolic and economic scenarios related to mobile residence patterns.

The metabolic explanation (Parkington 1991) suggested that coastal diets were essentially rich in protein and that collagen is synthesized mainly from dietary proteins, as experimental observations on laboratory rats have recently suggested (Ambrose & Norr 1993). Most relevant, the over-abundance of dietary protein at the coast may have stimulated rapid bone turn over. Consequently, during visits to the coast, the isotopic ratios of peoples' collagen would have been exaggerated towards a more marine one, and previous isotopic ratios would have been replaced. Visits to the interior mountains would have slowed down this process because of the less protein-rich environment in that region. Thus hunter-gatherer collagen might have been characterized by an overall isotopically marine signal throughout their lives, but without implying a cessation of seasonal movements between coast and interior mountains. Although this is an interesting possibility, it does not explain what would have led highly mobile hunter-gatherers to bury their dead mostly at the coast and not in approximately equal numbers in both regions (Sealy & Van der Merwe 1986, 1987). The unequal numbers of skeletons found in these two areas cannot solely be attributed to more development and greater visibility of burials in coastal environments.

The economic explanation suggested a substantial reorganization of subsistence strategies during the megamidden period. Henshilwood *et al.* (1994) proposed that small parties of people from the interior (it was not specified whether Sandveld or interior mountains) visited the coast for brief periods, during which extractive efforts were narrowly directed towards the collection of large quantities of black mussels and subsequent processing in the form of drying. As a result of these logistically organized visits, megamiddens were built up and substantial amounts of dried shellfish were transported to the "interior". Their subsequent consumption would have helped to exaggerate the marine signature of the bone collagen (see above) and seasonal transhumance would have remained unchanged. In Chapter 6, however, it was pointed out that there is no evidence for movements between the coast and interior mountains during the megamidden period.

It is clear that the discussion around subsistence mix in the south western Cape is difficult to disassociate from that around settlement patterns and mobility. In Chapters 6 and 7, it was concluded that hunter-gather settlement over the last 4300 years was characterized by mobility increasingly restricted to the coastal strip, particularly from 3500 BP onwards to nearly present time. According to this recent reconstruction, seasonal movements between coast and interior would have been very infrequent. This set of evidence leads to the consideration of a different scenario regarding hunter-gatherer subsistence. Thus, as is shown in the following paragraphs and contrary to Parkington's (1981: 431, see above) explicitly stated assumptions, a subsistence formula resulting from a semi-permanent or permanent residence pattern at the coast can be allowed. Delayed food consumption by means of storage (Smith *et al.* 1992; Henshilwood *et al.* 1994) would have constituted an important subsistence strategy, particularly during the megamidden period. Moreover, current and updated studies on the natural history of marine life in the west coast (Chapter 3) show that a balanced diet could have been achieved during relatively long visits without a significant risk of protein poisoning, contrary to Noli & Avery

Table 8.1: Scientific and common names of faunal species appearing in Tables 8.2, 8.5 and 8.7. Common names were established after Skinner & Smithers (1990).

SCIENTIFIC NAME	COMMON NAME
Leporid	Hare
Lepus capensis	Cape hare
Pronolagus rupestris	Smith's red rock rabbit
Bathyergus suillus	Cape dune mole rat
Hysterix africaeaustralis	Cape porcupine
Papio ursinus	Chacma baboon
Canis spp.	Jackal/dog
Canis mesomelas	Black-backed jackal
Ictonyx striatus	Striped polecat
Mellivora capensis	Honey badger
Small viverrid	Indeterminate small mongoose
Galerella pulvurulenta	Small grey mongoose
Herpestes ichneumon	Large grey mongoose
Atilax paludinosus	Water mongoose
Felis libyca	African wild cat
Felis caracal	Caracal (large wild cat)
Panthera pardus	Leopard
Sus scrofa	Feral pig (non indigenous species)
Orycteropus afer	Aardvark
Procavia capensis	Rock dassie (southern African hyrax)
Arctocephalus pusillus	Cape fur seal
Sylvicapra grimmia	Common duiker (small-medium bovid)
Raphicerus campestris	Steenbok (small bovid)
Raphicerus melanotis	Grysbok (small bovid)
Ovis aries	Sheep (small-medium bovid)
Rhinocerotid	Rhinoceros
Taurotragus oryx	Eland (large bovid)
Syncerus caffer	Cape buffalo (large bovid)
Bos taurus	Cattle (large bovid)

(1988) assertions. Furthermore, palaeoenvironmental conditions in the study area were significantly more favourable than today during the megamidden period and during two other palaeoclimatic cycles over the last 5000 years (Chapters 3 and 5; Jerardino 1995b). This would have allowed for a good supply of terrestrial plants, and improved marine productivity. Consequently, the composition of food remains (excluding plant remains for reasons of their poor preservation) present at sites in the study area dating to between 3500 and 2000 years ago is regarded overall as an approximate reflection of the dietary mix of hunter-gatherer groups during most parts of the year.

METHODS AND LABORATORY ANALYSES:

Faunal remains were sorted into various categories (e.g. mammal, tortoise, OES, bird, fish, marine shell, crayfish) and then weighed (or counted as in the case of crayfish) by stratigraphic unit. The minimum number of individuals (MNI) of crayfish was established by taking the highest count of either right or left mandibles. Weight observations obtained from highly burned osteological and shell material (e.g. Layer 4a of Steenbokfontein Cave) were corrected in order to compensate for the loss of weight. In this instance, correction factors established with experimental data was used (Jerardino & Yates 1996). Details of the analytical procedures for the study of shellfish remains have already been described in Chapter 5. Frequencies of shellfish species are reported as average percentages of total weight of samples.

Mammal and tortoise identification and quantification were undertaken by R. Klein (Tortoise Cave and Steenbokfontein Cave) and P. Nilssen (Pancho's Kitchen Midden). In the case of Tortoise Cave, faunal analyses have been already reported (Klein & Cruz-Uribe 1987). The results presented here are updated according to the new stratigraphic sequence of the site. In all instances, faunal observations are presented for each stratigraphic layer, and observations for groups of layers are also reported for purposes of inter-site comparison. The MNI counts for combined layers are simple sums and this assumes that the layers are temporally and behaviourally discrete entities. Identification and quantification of all faunal material from several megamiddens was undertaken by the writer.

Changes in density of preserved dietary remains are here considered to be particularly informative about the relative contributions of the different types of food, especially in those instances when marked changes are detected and appear to be repeated from site to site (Glassow & Wilcoxon 1988; Hall 1990). This alternative methodological approach attempts to overcome the discrepancies between the archaeological and isotopic observations in previous palaeodietary reconstructions suggested for the western Cape. Although shell and bone weight loss due to leaching and weathering did probably take place, these postdepositional processes seem not to have been extreme enough to reflect markedly skewed ratios.

Densities of faunal and cultural remains were calculated by dividing the weights (or MNI in the case of crayfish) by the number of buckets excavated from each layer. Because not all the shell remains were recovered from each layer, but only sampled, densities of marine shell were calculated by averaging density values of several shell bulk samples. Detailed observations of weight and density of faunal remains for each excavated site appear in Appendix 2.

Several faunal ratios were calculated for the purpose of detecting changes in subsistence strategy. NISP (number of identified specimens) ratios of large and large-medium bovids against small and small-medium bovids are established in order to monitor possible changes in the emphasis of hunting compared to snaring. Hunting involves greater risks and costs in the procurement of meat, but offers high nutritional yields. On the other hand, risk and costs involved in the obtaining of meat by snaring are considerably smaller, but this alternative strategy returns relatively lower nutritional yields. The "hunting index" was calculated by simply dividing the number of NISP of one group by the number of NISP of the other. A similar index was used by Broughton (1994a,b) with the purpose of determining changes in the mammalian foraging efficiency and resource intensification at various localities in California during the late-Holocene.

Density ratios of mammal against tortoise are calculated as a means of evaluating the degree of reliance on one of the most predictable, although low return, terrestrial vertebrate prey when compared to those more mobile and less predictable species (e.g. bovids, rock hyraxes). Mass density ratios instead of NISP ratios are used here because of the lack of NISP observations of tortoises for the majority of the bone assemblages. Hence, mass density observations of mammal bones were divided by that of tortoise bones.

The density ratio of terrestrial against marine remains is used as an overall index of hunter-gatherer dietary mix. Bird and crayfish densities are excluded from these calculations. This is because the bird bone assemblage has not yet been identified to species level, and hence the different proportions of marine and land species are not known. MNI densities of crayfish are not comparable to mass densities established for the rest of the food remains. Weighing the crayfish mandibles would not resolve this problem, as many of the recovered crayfish mandibles

Table 8.2: Number of Identified Specimens/Minimum Number of Individuals (NISP/MNI) of large mammal species and tortoises at Tortoise Cave (R. Klein pers. comm.).

	LAYER															
SPECIES	1A	1B	2A	2B	3A	3B	**1A-3B**	5	6	7	8	**5-8**	10	11	13A	**10-13A**
Leporid	29/3	2/1	26/2	16/2	12/1	-/-	**85/9**	2/1	2/1	1/1	-/-	**5/3**	16/2	4/2	6/1	**26/5**
Bathyergus suillus	166/12	26/2	107/9	67/5	20/2	24/3	**410/33**	8/1	15/2	12/2	13/4	**48/9**	365/23	98/9	92/7	**555/39**
Hystrix africaeaustralis	1/1	1/1	-/-	-/-	1/1	1/1	**4/4**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Papio ursinus	-/-	-/-	1/1	-/-	-/-	-/-	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Canis mesomelas	-/-	-/-	-/-	-/-	1/1	-/-	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-	2/1	-/-	**2/1**
Ictonyx striatus	1/1	-/-	1/1	1/1	1/1	-/-	**4/4**	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1	-/-	**1/1**
Mellivora capensis	-/-	-/-	-/-	-/-	-/-	1/1	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Galerella pulverulenta	11/2	-/-	4/2	8/1	-/-	2/1	**25/6**	3/1	1/1	2/1	-/-	**6/3**	4/1	-/-	3/1	**7/2**
Felis libyca	-/-	-/-	1/1	-/-	-/-	1/1	**2/2**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Felis caracal	-/-	-/-	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	-/-	**-/-**	1/1	1/1	-/-	**2/2**
Sus scrofa	1/1	-/-	-/-	-/-	-/-	-/-	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Orycteropus afer	-/-	-/-	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1	1/1	**2/2**
Arctocephalus pusillus	18/2	4/1	57/2	35/2	41/2	20/1	**175/10**	-/-	1/1	-/-	-/-	**1/1**	40/1	9/3	21/2	**70/6**
Procavia capensis	92/8	19/2	59/10	27/2	12/2	12/1	**221/25**	3/1	5/1	3/2	2/1	**13/5**	28/2	8/3	13/2	**49/7**
Sylvicapra grimmia	-/-	-/-	1/1	-/-	-/-	-/-	**1/1**	-/-	-/-	1/1	-/-	**1/1**	-/-	1/1	2/1	**3/2**
Raphicerus campestris	4/2	1/1	11/5	9/6	2/1	2/2	**29/17**	-/-	-/-	-/-	-/-	**-/-**	1/1	2/2	2/2	**5/5**
Raphicerus melanotis	1/1	-/-	-/-	1/1	-/-	1/1	**3/3**	-/-	-/-	-/-	-/-	**-/-**	-/-	2/2	-/-	**2/2**
Raphicerus spp.	90/4	38/4	132/9	115/7	122/4	146/6	**643/34**	31/2	60/2	32/3	15/1	**138/8**	234/5	122/5	134/4	**490/14**
Ovis aries	14/2	1/1	28/6	13/3	9/1	-/-	**65/13**	1/1	-/-	-/-	-/-	**1/1**	-/-	-/-	-/-	**-/-**
Rhinocerotid	1/1	1/1	5/1	2/1	-/-	-/-	**9/4**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Taurotragus oryx	3/2	1/1	1/1	1/1	-/-	-/-	**6/5**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	1/1	**1/1**
Syncerus caffer	-/-	-/-	-/-	-/-	-/-	2/1	**2/1**	-/-	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	**-/-**
Small bovid	90/4	38/4	132/9	115/7	122/4	146/6	**643/34**	31/2	60/2	32/3	15/1	**138/8**	234/5	122/5	134/4	**490/14**
Small-medium bovid	19/2	2/1	36/6	21/3	13/1	1/1	**92/14**	1/1	-/-	1/1	-/-	**2/2**	2/1	2/1	2/1	**6/3**
Large-medium bovid	1/1	1/1	-/-	-/-	-/-	1/1	**3/3**	-/-	1/1	-/-	-/-	**1/1**	-/-	-/-	-/-	**-/-**
Large bovid	3/2	2/1	2/1	2/1	1/1	4/1	**14/7**	-/-	3/1	-/-	-/-	**3/1**	1/1	7/2	7/1	**15/4**
Tortoise	xx/25	xx/4	xx/11	xx/11	xx/6	xx/6	**xx/63**	xx/1	xx/4	xx/2	xx/1	**xx/8**	xx/25	xx/8	xx/13	**xx/46**

Table 8.3: NISP ratios of large and large-medium bovids to small and small medium bovids, and density ratios of mammal to tortoise bone established for Tortoise Cave.

DATE (BP)	L+L.MED : S+S.MED	MAMMAL : TORTOISE
760-1800	0.02	1.7
3160-4020	0.03	0.9
4190-4330	0.03	1.3

Table 8.4: Densities of ostrich egg shell (OES) fragments, tortoise, terrestrial mammal, fish bones and crayfish (*Jasus lalandii*) in each episode of occupation at Tortoise Cave. Whilst crayfish densities are expressed as minimum number of individuals per bucket (MNI/bkt), the other faunal categories are expressed as mass per bucket (g/bkt). Density values for each stratigraphic layer are found in Appendix 2.

DATE (BP)	OES	TORTOISE	MAMMAL	FISH	CRAYFISH
760-1800	1.6	8.0	13.4	15.1	0.3
3160-4020	0.9	7.9	7.8	2.0	0.5
4190-4330	1.8	20.2	27.1	19.2	0.1

are broken and refitting would have to be attempted in order to have the minimal representation of single individuals (one mandible) in terms of weight. This value would also depend on whether a right or a left mandible is being refitted, as the former is consistently smaller than the latter in every specimen and independent of the animal's body size (Grindley 1976). In the ideal case that a single type of mandible (left or right) could be refitted for every individual represented in the recovered material, their total weight for each layer would not change the terrestrial to marine ratios in any substantial way.

Table 8.1 presents a list of scientific and common names of mammal species identified for Tortoise Cave, Pancho's Kitchen Midden and Steenbokfontein Cave, as well as for several megamiddens in the research area. The list includes twenty five identifications to species level, one to genus and three to family level. Of this total, three correspond to domestic species.

DIETARY RESOURCE MIX AT TORTOISE CAVE:

Most mammal bones at Tortoise Cave are from small bovids (*Raphicerus* spp), rock hyrax (*Procavia capensis*) and Cape dune mole rat (*Bathyergus suillus*). It seems, however, that the latter species might have been introduced to the site by predators other than people, such as the Cape eagle owl (Klein & Cruz-Uribe 1987: 143-145). Small viverrids, felines, jackals and other small carnivores might have died at this site or been brought to it either by people or other agents. It is possible that people might have collected these species for their pelts (see Hall [1990: 82]; and Mazel [1989: 55] for a similar suggestion). Cape dune mole rats might also have been collected by people for the same reason.

Several broad trends in the frequency of mammal species identified by Klein & Cruz-Uribe (1987) still hold after the re-organization of Tortoise Cave stratigraphy. For instance, domestic sheep (*Ovis aries*) occur for the first time in layers dating to *c.* 1800 BP. In these same layers, Cape fur seal (*Arctocephalus pusillus*) and rock hyrax also become more prominent. Hunted fauna, such as large and large-medium bovids, are present throughout this sequence, including layers dating to the last 2000 years. Tortoise bone remains are largely represented by one species, the angulate tortoise (*Chersina angulata*).

The NISP ratio of large and large-medium bovids against small and small-medium bovids remains virtually the same from one episode of occupation to the next (Table 8.3). Nevertheless, positive identification of two large mammals (Cape buffalo and rhinocerotid) were made only from the younger levels (Table 8.2). Another faunal index for hunting is shown by the density ratio of mammal against tortoise bone (Table 8.3). The results show that the collection of tortoise was moderately more frequent than the hunting and snaring of mammals between *c.* 4000 and *c.* 3100 BP (talus occupation).

In sum, frequencies of mammal species at Tortoise Cave remained approximately the same between 4300 and 3160 BP, with changes in their relative proportion taking place during the latest occupation between 1800 and 760 BP. These changes involved an increase in the collection of two indigenous species (Cape fur seal and rock hyrax) and the acquisition of domestic sheep as a result of contact with stock owners. However, when the mammal record is compared to that of tortoise, changes appear to have taken place before 2000 BP, with tortoise collection being moderately emphasized between *c.* 4000 and 3100 BP.

No major changes in the frequency of shellfish species are detected at Tortoise Cave. Throughout this sequence, black mussel (*Choromytilus meridionalis*) is the most frequent species (89% - 68%), followed by limpets (*Patella* spp.) (13% - 4%), whelks (*Burnupena* spp and *Nucella* spp) (10% - 2%), ribbed mussel (*Aulacomya ater*) (6% - 0%) and barnacles (mostly *Austromegabalanus cylindricus*, and small amounts of *Notomegabalanus algicola*) (1.5% - 0.2%). Statistically significant changes in the mean sizes of black mussel and the limpet *Patella granatina* have been reported for this particular sequence (Chapter 5; Jerardino 1993). Coincident, but reverse changes in the mean sizes of these two species, however, are not explained by intense collection and eventual over-exploitation of one or the other resource in the past. Rather, a shift of collecting localities, as a result of the drowning or exposure of Mussel Point with fluctuating sea levels, accounts for most of the detected differences (Chapter 5; Jerardino 1993).

Table 8.4 shows the mass densities of OES, tortoise, mammal and fish, as well as MNI densities of crayfish for each episode of occupation. Except for crayfish, there is a remarkable similarity in the trends of densities for each faunal category from one episode of occupation to the next. In these instances, the densities of faunal remains decrease 2 to 9 times in the talus deposits (*c.* 4000-3100 BP). No reliable density values for marine shell can be suggested for the different episodes of occupation, because associated volumes of shell samples are only available for very few samples, all of which belong to Layers 1a to 3a. Nevertheless, field descriptions, photographic observations and sieved samples processed back at the laboratory indicate that most of the talus volume comprises shell material (Robey 1984; Jerardino 1995a). Subsequent to the talus deposition, most of the densities calculated for the different faunal categories tend to

Table 8.5: Number of Identified Specimens/Minimum Number of Individuals (NISP/MNI) of large mammal species and tortoises at Pancho's Kitchen Midden (P. Nilssen pers. comm.). NISP for Tortoises are available, but were not included in this table.

	LAYER									
SPECIES	Surface	1	2	**1-2**	3	4	5	6	**4-6**	7
Lepus capensis	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	1/1	**1/1**	-/-
Pronolagus rupestris	-/-	-/-	-/-	**-/-**	-/-	-/-	1/1	-/-	**1/1**	1/1
Bathyergus suillus	-/-	-/-	-/-	**-/-**	-/-	19/5	3/1	10/2	**32/8**	4/2
Papio ursinus	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	-/-	**-/-**	4/1
Canis spp.	-/-	-/-	7/1	**7/1**	-/-	-/-	2/1	-/-	**2/1**	1/1
Ictonyx striatus	-/-	-/-	-/-	**-/-**	-/-	1/1	-/-	-/-	**1/1**	-/-
Mellivora capensis	-/-	-/-	-/-	**-/-**	1/1	-/-	-/-	-/-	**-/-**	-/-
Galerella pulverulenta	-/-	-/-	-/-	**-/-**	1/1	-/-	-/-	8/1	**8/1**	2/1
Atilax paludinosus	-/-	-/-	2/1	**2/1**	-/-	-/-	-/-	-/-	**-/-**	-/-
Small carnivore	-/-	-/-	1/1	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-
Felis lybica	-/-	-/-	-/-	**-/-**	-/-	-/-	-/-	-/-	**-/-**	1/1
Panthera pardus	-/-	1/1	-/-	**1/1**	-/-	-/-	-/-	-/-	**-/-**	-/-
Arctocephalus pusillus	-/-	7/1	-/-	**7/1**	-/-	-/-	1/1	7/1	**8/2**	-/-
Procavia capensis	-/-	-/-	1/1	**1/1**	-/-	-/-	2/2	5/1	**7/3**	3/1
Sylvicapra grimmia	-/-	1/1	-/-	**1/1**	3/1	-/-	1/1	2/1	**3/2**	4/1
Raphicerus campestris	-/-	-/-	-/-	**-/-**	-/-	-/-	1/1	1/1	**2/2**	-/-
Raphicerus spp.	2/1	2/1	1/1	**3/2**	7/1	18/3	7/2	17/1	**42/6**	36/3
Taurotargus oryx	-/-	-/-	-/-	**-/-**	-/-	1/1	-/-	-/-	**1/1**	1/1
Small bovid	6/1	33/1	27/1	**60/2**	19/1	37/3	13/2	24/2	**74/7**	48/3
Small-medium bovid	11/1	54/1	7/1	**51/2**	8/1	34/1	11/1	21/1	**66/3**	119/2
Medium bovid	3/1	8/1	1/1	**9/2**	3/1	1/1	-/-	-/-	**1/1**	3/1
Large-medium bovid	-/-	16/1	-/-	**16/1**	-/-	1/1	5/1	12/1	**18/3**	21/1
Large bovid	-/-	67/1	1/1	**68/2**	-/-	5/1	1/1	-/-	**6/2**	1/1
Tortoise	xx/4	xx/18	xx15	**xx/33**	xx/4	xx/8	xx/7	xx/13	**xx/28**	xx/10

Table 8.6: NISP ratios of large, large-medium and medium bovids to small and small medium bovids, and density ratios of different categories of faunal remains established for Pancho's Kitchen Midden. The marine component excludes crayfish.

DATE (BP)	L+L.MED+M : S+S.MED	MAMMAL : TORTOISE	TERRESTRIAL : MARINE
570-880	0.84	0.4	8.0
2640	0.11	0.2	1.4
2940-3060	0.17	0.3	3.5
3570	0.15	0.5	5.4

increase, except for tortoise, which shows a slight decrease (Table 8.3). Thus, it is possible to conclude that shellfish and crayfish collection, and most probably their consumption, was markedly emphasized between *c.* 4000 and 3100 BP. This observation is interpreted as an increase in the proportion of marine food resources in hunter-gatherer diet during visits to the coast in the millennia before the megamidden period.

The reason why fish frequencies do not follow the trend of other marine food stuffs is probably because of a marked decrease in their availability. Several estuarine and semi-estuarine species of fish were caught in proportionally large numbers in what is known today as Verlorenvlei (Poggenpoel 1987). As the conditions around the mouth of this body of water were quickly changing from fully estuarine to coastal lake at about 3500 BP (Poggenpoel 1987; Chapter 5) the numbers of fish species and general abundance were drastically reduced.

DIETARY RESOURCE MIX AT PANCHO'S KITCHEN MIDDEN:

The mammal bone assemblage at Pancho's Kitchen Midden is dominated by bovids of different body sizes, although small to small-medium individuals are the most common (Table 8.5). Cape dune mole rat is relatively more common in Layers 4 to 6. Most of these may well have been caught by people, as the shelter of Pancho's Kitchen Midden offers little protection as a roosting spot for large owls and eagles. Furthermore, human occupation of this site was particularly intense during the accumulation of these particular layers (Chapter 6), which probably discouraged other potential occupants from visiting this particular rock shelter. Most if not all the tortoises are angulate (Nilssen pers. comm.).

The NISP ratio of large, large-medium and medium bovids against small to small-medium bovids does change through time (Table 8.6). The lowest value is recorded for Layer 3, dating to *c.* 2600 BP, pointing to a greater emphasis on snaring small territorial browsers, such as *Raphicerus* spp (steenbok and grysbok). This change seems quite extreme, as no large or large-medium bovids were identified from Layer 3. A relatively large number of bones from juvenile animals were also found in several different layers (Nilssen pers. comm.). Although some could be the result of carnivore activity (Nilssen pers. comm), young and vulnerable animals could have also been caught by people, despite their low nutritional return. Clearly, the little hunting that was done during visits to Pancho's Kitchen Midden was even rarer during the megamidden period, and the procurement of bovid meat during this period was resolved through snaring and/or chasing steenbok and grysbok along the paths cleared by these territorial antelopes (see

Skinner & Smithers 1990). The ratio of tortoise to mammal bone densities (Table 8.6) also points to a decline in hunting and snaring altogether, and an increase in the collection of tortoises during the megamidden period.

Moderate changes in the frequencies of shellfish species are apparent only in the last thousand years, although black mussels clearly dominate the mollusc assemblage throughout this sequence (Table 5.7 and Fig. 5.4, see Chapter 5 for detail discussion). As already concluded in Chapter 5, changing frequencies of shellfish species over the last thousand years seem to reflect the reformulation of shellfish gathering practices by groups of people who were acquainted with a different type of subsistence system, namely pastoralism. Changes in the mean sizes of the most frequently collected shellfish species during the pre-Pottery Period occupation of Pancho's Kitchen Midden are explained mostly as a result of changes in water turbidity levels. Larger mean sizes of black mussel were attained around 600 BP as a combination of cold sea surface temperatures, low water turbidity, low intensity of shellfish gathering due to infrequent or short timed visits to this site, and a more generalized shellfish collection that included the upper subtidal ranges (Chapters 5 and 6).

The trend in the dietary mix of hunter-gatherers as reconstructed from Pancho's Kitchen Midden consists of a progressive increase in the consumption of marine foods until *c.* 2600 BP, and a subsequent change towards a more terrestrially oriented diet in the last thousand years (Table 8.6). The rôle of shellfish gathering, and to a lesser extent fishing (see Appendix 2), was most important in obtaining larger amounts of marine food. As hunter-gatherer diets shifted towards being more marine based, the procurement of meat of terrestrial origin was also reformulated. Tortoises were collected even more regularly, and ungulate meat was mostly obtained by snaring rather than hunting.

DIETARY RESOURCE MIX AT STEENBOKFONTEIN CAVE:

The range of mammal species at Steenbokfontein Cave (Table 8.7) is broadly similar to that of Pancho's Kitchen Midden. Small bovids, small medium bovids, Cape fur seal and rock hyrax are the most frequent species in this particular bone assemblage. Cape dune mole rats are also conspicuous in Layers 1 to 3, and may have been brought into the site by both people and large raptors. Large and large-medium bovids are either absent or very infrequent in Layer 1 and 2. Domestic sheep and cattle (*Bos taurus*) are present in surficial deposits and in Layers 1 and 2. The dates associated with the remains of domestic fauna are older than the ages of those remains

Table 8.7: Number of Identified Specimens/Minimum Number of Individuals (NISP/MNI) of large mammal species and tortoises at Steenbokfontein Cave (R. Klein pers. comm.).

				LAYER			
SPECIES	Surface	1	2	3	**1-3**	4A	4B
Leporid	2/2	3/1	1/1	9/1	**13/3**	2/1	2/1
Bathyergus suillus	-/-	9/2	8/1	12/2	**29/5**	-/-	4/2
Hystrix africaeaustralis	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1
Canis mesomelas	-/-	2/1	-/-	-/-	**2/1**	-/-	-/-
Small viverrid	-/-	1/1	-/-	-/-	**1/1**	-/-	-/-
Galerella pulverulenta	3/1	-/-	-/-	-/-	**-/-**	2/1	1/1
Herpestes ichneumon	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1
Felis libyca	-/-	-/-	-/-	2/1	**2/1**	4/1	2/1
Felis caracal	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1
Arctocephalus pusillus	-/-	52/3	1/1	12/1	**65/5**	6/1	13/1
Procavia capensis	3/1	12/2	3/1	5/1	**20/4**	12/4	9/1
Orycteropus afer	-/-	-/-	-/-	-/-	**-/-**	-/-	1/1
Sylvicapra grimmia	-/-	4/3	1/1	4/1	**9/5**	3/2	-/-
Raphicerus campestris	-/-	2/1	1/1	2/1	**5/3**	6/3	4/2
Raphicerus spp.	12/3	117/4	45/4	190/5	**352/13**	224/8	215/7
Ovies aries	1/1	1/1	1/1	-/-	**2/2**	-/-	-/-
Bos taurus	1/1	-/-	-/-	-/-	**-/-**	-/-	-/-
Small bovid	12/3	135/4	51/4	187/5	**373/13**	246/8	222/7
Small-medium bovid	1/1	15/3	3/1	13/1	**31/5**	17/2	5/2
Large-medium bovid	-/-	2/1	-/-	1/1	**3/2**	1/1	2/1
Large bovid	1/1	1/1	-/-	3/1	**4/1**	7/1	10/1
Tortoise	xx/3	xx/18	xx/12	xx/28	**xx/58**	xx/17	xx/11

Table 8.8: NISP ratios of large and large-medium bovids to small and small medium bovids, and density ratios of different categories of faunal remains established for Steenbokfontein Cave. Terrestrial fauna excludes microfauna and the marine component excludes crayfish.

DATE (BP)	L+L.MED : S+S.MED	MAMMAL : TORTOISE	TERRESTRIAL : MARINE
2200	0.02	0.2	36.3
2360	0.00	0.2	24.0
2490-2690	0.02	0.2	35.2
3510-3640	0.03	0.7	32.0
3990-6070	0.05	1.1	57.8

that have been found in reliable archaeological contexts from the western Cape (Sealy & Yates 1994). Thus, considering the proximity of these few pieces in Layers 1 and 2 to the present surface of the cave, it seems reasonable to conclude that they might be intrusive. Further excavations leading to the recovery of more specimens and their direct dating, would provide more conclusive observations. Tortoise bones are again from angulate tortoises.

As is already apparent from Table 8.7, the NISP ratio of large and large-medium bovids to small and small-medium bovids changes through time (Table 8.8). Lowest values are reached during the megamidden period, meaning that very little or no hunting was undertaken, and that the great majority of the ungulate meat was obtained through snaring and/or chasing small territorial browsers. The mammal to tortoise ratio shows also a sustained increase in the collection of tortoises at the expense of hunting and snaring. When the *c.* 4000 - 6100 BP faunal record is compared to the younger ones, it is clear that a substantial number of tortoises were already being collected by *c.* 3500 BP, and that an even more intense strategy of tortoise exploitation characterized the megamidden period.

It seems that only one substantial shift in the proportions of collected shellfish species at Steenbokfontein Cave occurred between approximately 6000 and 2200 years ago. Although black mussels were the most frequently collected species during these few millennia, this species was gathered even more frequently after *c.* 3000 BP. Layers 4a and 4b present very similar shellfish profiles, and taken together, black mussels dominate with frequencies ranging between 62% to 65%, followed by limpets (12.4% - 16.7%), whelks (18.2% - 19.0%), and barnacles (0.4% - 0.5%). Shellfish frequencies of Layers 1 to 3 are also very similar to each other. Black mussels dominate here, with higher values between 78% and 86%, followed again by limpets (4.8% - 5.8%) and whelks (5.2% - 7.7%), both with lower frequencies than before, and barnacles (0.2% - 0.7%). The increase in the representation of black mussels in Steenbokfontein Cave during the megamidden period is likely to be the result of a combination of different causes. These probably consist of ecological changes due to shifts in oceanographic conditions (Chapters 3 and 5) and the reformulation of shellfish collecting practices, which would have involved preference for black mussels over other species (see below).

Plant remains are abundant and very well preserved in unburnt shell lenses at Steenbokfontein Cave. Twigs of various sizes, corm casings, seeds of different types and kelp (*Ecklonia maxima*) were particularly well represented in Layers 1 to 3. Although the identification of the recovered plant material has not yet been finalized, it is clear from the amounts observed that the consumption of carbohydrates of terrestrial, and possibly marine, origin was significant during visits to Steenbokfontein Cave. The interpretation of the stone tool evidence (Chapter 7) suggests that the marked increase in adzes during the megamidden period was related to greater demands in the manufacture of digging sticks for obtaining larger amounts of plant foods. The abundance of botanical remains at Steenbokfontein Cave is in line with this suggestion.

But besides underground corms, roots, and seeds found in the Sandveld (Sealy 1986), seaweeds and kelp can also be a rich source of metabolic energy (Chapter 3). Ethnographic records and early travellers accounts have not offered insights about the use of marine plants as food by indigenous people on the Namibian coast (Budack 1977), where most ethnohistorical observations of coastal dwellers of the west coast have been made. The only use that coastal dwellers had for kelp stems was as containers for the storage of whale oil and blubber (Budack 1977). Nevertheless, the consumption, preservation and trade of several species of algae by coastal groups of the Pacific coast have been described in early colonial records (Bittman 1986; Masuda 1986). This is a practice that continues in Peru and Chile until today (Masuda 1986). Thus, it is likely that the consumption of seaweed and kelp might have also been familiar to precolonial communities of southern Africa over the last few millennia. This could have been particularly true for periods when intertidal resources became an important component in hunter-gatherer diet, as people would likely have explored the full potential of this marine zone.

The overall trend in hunter-gatherer dietary mix, as reflected from Steenbokfontein Cave observations, consists of an increase in the marine component after approximately 3600 years BP until 2200 years BP (Table 8.8). Considerably more terrestrial fauna was included in people's diet between *c.* 4000 and 6100 BP when visiting this site. During these two millenia, relatively larger amounts of ungulate mammal meat was brought to the site, a proportion of which was obtained by hunting large to large-medium bovids. Terrestrial and marine plants seem to have been also collected, and shellfish was also gathered, but to a lesser extent (Table 8.8). Subsequently, between *c.* 3600 and 2200 BP, a significantly larger amount of marine food was part of the resource base of local hunter-gatherers. Shellfish collection and consumption became most prominent, and plant food continued to be collected frequently, perhaps also including kelp. At the same time, the relative contribution of faunal species within the terrestrial component of people's diet changed. Tortoise collection and consumption was emphasized at the expense of mammals, and, regarding the latter, the snaring of small to small-medium bovids was preferred over hunting larger bovids during the megamidden period (Table 8.8).

DIETARY RESOURCE MIX AT SEVERAL MEGAMIDDENS:

It seems almost a futile exercise to quantify the resource mix from various megamiddens because of their clear and overwhelming marine signature. Nevertheless, the quantification of the different categories of dietary remains in each sampled megamidden can show the diversity in their contents beyond the fact that they are dominated by shellfish refuse. For instance, megamiddens to the north of Wadrifsoutpan (Grootrif D and Malkoppan) contain many more crayfish counts relative to shell weights than those to the south of that geographic point (Appendix 2). Furthermore, within the category of non-molluscan fauna dating to before 2000 BP, Grootrif D and Mike Taylor's Midden show a dominance of fish and marine bird over terrestrial species (e.g. tortoise and small bovid). The remaining faunal assemblages present an even mixture of these categories. Bone remains of large or large-medium bovids have not been observed from any of the test excavations undertaken at megamiddens. The explanation behind all of these contrasts probably lies with the different purposes of visits to these sites through time and geographical space (Chapter 6), as well as with variations in the availability of different types of marine resources along the coast line. Plant food remains are nonexistent at these sites, probably because of the highly unfavourable conditions for the preservation of botanical remains (terrestrial and marine) in these deposits.

Black mussel overwhelmingly dominates the shellfish assemblage of megamiddens (Buchanan 1988; Henshilwood *et al.* 1994). Limpets are, nonetheless, present in unusually high frequencies (64% - 10%) in several shell lenses of Grootrif D (Yates 1989; own data). It seems ecologically unlikely that rocky shorelines near megamiddens would have offered only very low numbers of limpets. As already shown, oceanographic conditions during the megamidden period were conducive to high marine productivity along parts of the west coast (Chapter 3; Jerardino 1995b). Thus, it is possible that during that period, black mussels might have encroached (partially) into areas in the lower reaches of the intertidal and upper subtidal zones that were previously occupied by a few species of limpets (e.g. *P. argenvillei*, *P. barbara* and *P. miniata*). Nevertheless, the encroachment of black mussels into limpet space within the mid and upper intertidal zones was probably not as extensive as it might have been in the case of the lower intertidal and upper subtidal zones. The mid and upper intertidal poses strong metabolic and ecological limitations to the success of black mussel colonies because of longer periods of desiccation, shorter feeding time and increased natural predation (Branch & Griffiths 1988: 421, 431). One would expect that limpet species occurring in these higher zones (*P. granatina* and *P. granularis*) were still available in fairly large numbers during the megamidden period. This expectation is also applicable to low-lying and exposed reefs (e.g. Mussel Point), which favour the growth of filter feeder communities over grazers (Chapter 3).

Consequently, the low frequencies of limpets in most megamiddens and in Layers 1 to 3 of Steenbokfontein Cave might be, to some extent, the reflection of a particular strategy of shellfish collection between 3000 and 2000 BP. Black mussels, more than any other mollusc species, were targeted for collection during the megamidden period probably because, besides being a highly predictable resource, it is the most productive mollusc species per unit of surface area in low-angle rocky reefs (Buchanan 1988: 111). Moreover, black mussels are fast growers and reach reproductive maturity at a fairly small size (Griffiths 1981a). Hence, high demands for marine protein during the megamidden period would have been met without much difficulty by collecting black mussels as frequently as needed, and without a considerable risk of over-exploiting this resource. This risk would have been particularly low under generally improved marine productivity on the west coast during the megamidden period (Chapter 3; Jerardino 1995b).

It is possible that the higher numbers of limpets at Grootrif D reflect either a different purpose and/or season of occupation at this site than is the case for other mussel-dominated megamiddens. Parkington (1981: 354) suggested that high frequencies of limpets can be regarded as an indicator of summer occupation. Contrary to mussels, limpets seem not to accumulate toxins during red tide events, thus being a safe resource to consume during summer when red tides are more frequent. But on the other hand, Grootrif D seem likely to have been a site where a wider range of activities were undertaken, including those of domestic kind, in contrast to other mussel-dominated megamidden occupations (Chapter 6). As a basically non-shellfish processing station, decisions regarding the range of mollusc species to be collected from Grootrif D were not bound by the economic considerations that were dictating the choices of shellfish collection at other megamiddens (see above and Chapter 6). Hence, summer occupation and/or its use as a living site can be proposed as the main reason for the high frequencies of limpet species in the various lenses of Grootrif D.

DISCUSSION AND CONCLUSIONS:

The pattern

Subsistence trends through time are remarkably similar from site to site after 3500 BP. A relatively small amount of hunting was undertaken in the study area during the last 10 000 years when compared to the previous millennia (Klein & Cruz-Uribe 1987). However, hunting was even more rare after 3500 BP. This trend was clearly underway before the arrival of pastoralism to the western Cape at about 2000 BP. Hence, a decrease in hunting practices after 3500 BP cannot be understood as an outcome of competitive relationships between local hunter-gatherers and pastoralists (Parkington *et al.* 1986) any longer. In fact, the faunal record of Tortoise Cave, Pancho's Kitchen Midden and Eland's Bay Cave (Klein & Cruz-Uribe 1987) show that hunting was more frequently undertaken in the last 2000 years than during the megamidden period (Fig. 8.2).

As hunting was becoming substantially less relevant to coastal hunter-gatherer subsistence, <u>ungulate</u> <u>meat</u> was obtained mainly through snaring. Small and small-medium bovids were already providing the bulk of the <u>animal</u> <u>meat</u> of terrestrial origin before 3000 BP. This contribution to the overall subsistence base declined after this date, as tortoise consumption was also markedly emphasized after 3500 BP and throughout the megamidden period. Plant collection was also an important part of the diet after *c.* 3000 BP (Fig. 8.2) as reflected by the relative abundance of well preserved plant remains at Steenbokfontein Cave, and the increase in the production of tools related to the exploitation of plant resources, such as adzes (Chapter 7).

The trends in the procurement of terrestrial fauna were concomitant with a significant increase in the exploitation of marine resources, among which shellfish was most prominent. Testimony to this later and significant contribution to coastal hunter-gatherer diet is provided by the large talus of Tortoise Cave, Layers 6 to 3 of Pancho's Kitchen Midden, Layers 4a to 2 of Steenbokfontein Cave, and all the megamiddens. As already concluded in Chapter 6, many megamiddens were sites at which large-scale shellfish drying and processing took place alongside other activities. These other tasks included those of domestic character, which seem to have been spatially segregated from the work involved in processing and drying. Thus, shellfish was not only a significantly more important source of food in the every-day life of coastal hunter-gatherers between 3000 and 2000 BP, but a resource on which an economy of delayed-returns (see Woodburn 1982, 1988) was also based (Fig. 8.2). This issue will be discussed further in the following subsection.

Clearly, these results are indicative of an overall emphasis on low-effort and low-risk food procurement, targeting highly predictable (e.g. animals with territorial behaviour, sessile organisms and plants) and productive species of both marine and terrestrial origin during the megamidden period. This subsistence pattern is in marked contrast to that of previous occupations dating to before 3500 BP. Its particular and consistent character points also to a change in settlement involving a decrease in mobility range and greater sedentism (Fig. 8.2).

Spatial variations within these temporal trends are evident from the results presented in Tables 8.3, 8.6 and 8.8. Differences in the absolute values of NISP and density ratios from one site to the next are likely to be the reflection of the natural and variable abundances (and/or general availability) of prey choice to people within the foraging radius of each site. Season(s) of site occupation and their relation to site function, as well as to seasonal fluctuations in resource availability, are additional variables to consider when interpreting these differences.

Mammal to tortoise density ratios of Tortoise Cave are on average an order of magnitude larger than those calculated for Pancho's Kitchen Midden and Steenbokfontein Cave. Besides differences due to changes through time, differences between sites could be explained also in part by suggesting that the landscape surrounding Tortoise Cave has better access to areas where hunting and snaring of bovids could be undertaken more easily. On the other hand, Pancho's Kitchen Midden and Steenbokfontein Cave share similar mammal to tortoise ratios, but differ quite considerably in the values for bovid NISP ratios and terrestrial against marine ratios. Differential availability and/or capturability of prey species between the foraging radius of both sites seem to be a factor, but perhaps not a significant one, throughout both occupational sequences. Both of these sites are located in fairly similar environments and distance to the sea. Site function and season of occupation might explain these contrasts better within particular periods.

Differences in site function of Pancho's Kitchen Midden and Steenbokfontein Cave during part of the megamidden period, and slightly before it, were suggested in Chapters 6 and 7. On the one hand, Pancho's Kitchen Midden seems likely to have been occupied during dispersal phases (autumn-winter-early spring?), with people engaging in activities related to the exploitation, processing and storage of dried shellfish to cover the summer red-tide months (Fig. 8.2). Late spring to summer months might well have been devoted to other subsistence activities, such as the exploitation of berries, underground plants and honey, amongst others. A surplus of dried shellfish could also have been used on certain occasions during winter when shellfish collecting was difficult to undertake due to stormy weather. Shellfish seems also to have been collected in great quantities for immediate consumption at Pancho's Kitchen Midden. On the other hand, Steenbokfontein Cave was an aggregation center (late spring-summer?) during at least part of its occupational sequence. The procurement of food appears to have included a slightly different proportion of species than that of a dispersal camp, such as Pancho's Kitchen Midden.

Immediately after *c.* 2500 BP, occupation at Steenbokfontein Cave consisted of visits for purposes other than aggregation, and large to large-medium bovids disappear from the archaeological record. The diet becomes overall more marine than ever before. During subsequent occupations around 2200 BP, the dietary composition is very similar to that pre-dating 2400 BP. Despite a change in the character of visits to Steenbokfontein Cave after *c.* 2500 BP, bovid NISP ratios and terrestrial against marine ratios do not resemble those of Pancho's Kitchen Midden. In this particular case, differential availability and/or capturability of prey species between the foraging radius of both sites might explain the latter pattern.

The integration of the archaeological and isotopic data

According to the evidence presented above, the main source of protein in hunter-gatherer diet during the megamidden period was undisputably marine (Fig. 8.2). Shellfish was consumed on a daily basis and also processed and stored when this resource was "not available" (see next section).

Adequate supplies of energy-rich foods are part of a balanced and healthy diet. As already pointed out by Noli & Avery (1988), people do not live on protein alone, in fact a high protein based diet is harmful. The source of energy-rich foods during the megamidden period seems to have been of marine and/or terrestrial origin. Unfortunately, changes in the emphasis on one or another source are difficult to quantify in the way that has been done for the protein source. If meat and blubber of whales and seals were stored in the way Smith *et al.* (1992) have suggested, then frequencies of both species are under-represented in the archaeological record of the megamidden period. As both of these preys would have been processed at the beach, their transport to nearby sites (dispersal and aggregation sites) for such purpose would not have been necessary, and only a few body parts might have been taken there. Pieces of <u>deboned</u> whale or seal meat with blubber could have also been transported to sites. Only in the case of a few whale species, could this transport decision be traced in the archaeological record, as suggested elsewhere (Jerardino & Parkington 1993). There is evidence of one such instance at Steenbokfontein Cave dating to immediately after 3500 BP.

The excellent preservation of plant food remains at Steenbokfontein Cave and the concomitant increase in adze frequencies, suggest a more intense pattern of terrestrial plant exploitation during the megamidden period. It seems hard to argue against a significant input from terrestrial plants into the caloric metabolism of coastal hunter-gatherers, and to favour a more prominent rôle from marine animal fats and marine algae. The evidence at hand supports a subsistence scenario where plants with underground organs that are rich in carbohydrates were intensively collected during the megamidden period. Although not directly supported by the evidence, these resources could also have been processed and stored (see below).

In sum, palaeodietary observations inferred from the archaeological record are in close agreement with the isotopic results presented and discussed by Lee-Thorp *et al.* (1989). Nevertheless, the metabolic process involved in the incorporation of the molecular components of proteins and energy-rich foods into the different types of human tissues needs to be understood better, and current experimental work in this direction is underway (Young & Van der Merwe pers. comm.). It is possible that the results of this experimental work (based on domestic pigs, which are omnivorous like human beings) will show that stable carbon isotope ratios based on bone collagen samples do not reflect the source of the diet as a whole, but mainly that of proteins. Hence, Parkington's metabolic explanation (Parkington 1991; see above) may be relevant to the interpretation of isotopic values based on human collagen. Nevertheless, the additional archaeological evidence presented in this and previous chapters, as well as by Yates *et al.* (1994), does not support his contention that both inland and coastal regions were part of the same settlement system over the last 3500 years. Based on the evidence at hand, it is nonetheless possible to argue that seasonal transhumance between the coast and interior mountains might have characterized hunter-gatherer settlement before 3500 BP (Fig. 8.2). Further excavation programs in the Sandveld and interior mountains are essential for determining any possible integration of these two regions into a single settlement system before 3500 BP, and for testing the conclusions arrived in this thesis.

Resource intensification, population densities and social complexity

The concepts of resource intensification and hunter-gatherer social complexity have frequently been dealt with in the international anthropological and archaeological literature over the last twenty years (see below for references). Hence, a complete recapitulation of their definition, causes and consequences is not deemed necessary. Instead, a summary of the aspects most relevant for the results presented in this and other chapters is given below.

Many would agree with Ames' assertion that, "intensification has two faces: increased production and increased productivity. In either case, artefactual and site changes should reflect an increasing emphasis on certain resources and on special procurement and processing methods. We should also see evidence for an increasing reliance on storage" (Ames 1985: 171). This increased extractive capacity on behalf of hunter-gatherers becomes relevant to processes of social change and complexity when an increase in productive efficiency (productivity) results also in an absolute increase in production, a phenomenon frequently associated with a decrease in foraging range and surplus. In other words, "where intensification is about increased productivity but not increased production it need not be associated with social or demographic change" (Bender 1978: 206).

According to the many cases of resource intensification around the world (Price & Brown 1985; Ames 1991), including southern Africa (Mazel 1989; Hall 1990) and western Africa (Stahl 1993), hunter-gatherer subsistence becomes either more diverse or specialized. In some instances it might involve an overall decrease in foraging efficiency when the targeted prey consists of mobile animals such as vertebrates (Broughton 1994a,b). But efficiency might be mantained or perhaps even increased in some cases of intensification where the predictability of the resource is very high and the cost involved in its search and processing is very low, such as shellfish (Waselkov 1987; Erlandson 1988; Henshilwood *et al.* 1994). Whichever the case might be, food resources from lower trophic levels in the local food chains are frequently new additions to pre-existing resource bases. In cases where such resources were part of hunter-gatherer diet before intensification took place, the exploitation of these food items is markedly emphasized.

An increase in sedentism, larger and differentiated settlements, and higher population densities are frequently some of the *consequences* or *conditions* leading to resource intensification (Price & Brown 1985: 8-12). "However, population numbers or densities should not be regarded in terms of an absolute constant or threshold value. We cannot specify the number of people, abundance or environment, or the degree of circumscription that is necessary and sufficient for intensification to appear" (Price & Brown 1985: 10), as the relationship between population levels and resources can vary from one particular geographical area to the next even in absence of technological innovation (Ames 1991; Broughton 1994a,b). Cohen

(1975) has gone further with this argument by proposing that population pressure is the prime mover for the existence of resource intensification. This extreme position, however, has generated criticisms from many archaeologists (see Bender 1978; Johnson 1982; Price & Brown 1985 and references therein; Mazel 1989; Lourandos & Ross 1994) who regard population increase as either irrelevant, or a *condition*, but not a *cause* for resource intensification (see below).

Cultural complexity is a concept that has been difficult to define, although it has been frequently used for the recognition of the diversity present among prehistoric hunter-gatherer societies. "... [G]reater complexity implies more parts to the whole, more differentiation or specialization of these parts, and firmer integration of these parts within the whole" (Price & Brown 1985: 7). Intense subsistence practices, high population densities, and changes in the organization of social (at an inter- and intra-group level), economic and ritual structures, as well as the use of a more sophisticated technology, have been suggested as indices of increasing complexity in hunter-gatherer societies. Territorial behaviour, boundary maintenance and status differentiation can also raise and contribute to a higher degree in social complexity (Testart 1982; Price & Brown 1985; Lourandos & Ross 1994). All of these characteristics, or the combination of a number of them, can define different degrees of complex social configurations.

The trends in settlement patterns and subsistence from several sites in the research area are broadly consistent with the development of resource intensification as described elsewhere (Fig. 8.2). The economic changes experienced by hunter-gatherers throughout several centuries seem to have involved a shift from an immediate-return system to that of a delayed-return system (Woodburn 1982, 1988). The most important conditions leading to hunter-gatherer intensification in the Lambert's Bay and Eland's Bay areas, as far as the archaeological record has allowed us to determine, consist of a combination of environmental, demographic and social factors. This process might have also led to an increase in social complexity among the resident population.

The environment (marine and terrestrial) had clearly been propitious several times during the centuries covered by Neoglacial episodes over the last 4500 years (Jerardino 1995b). Nevertheless, this factor was not compelling enough to direct hunter-gatherer behaviour, as in only one such episode did resource intensification characterize their subsistence. What the environment did was to allow for a greater production and productivity of food during one such period. Coastal hunter-gatherer economy was driven by a combination of daily and weekly collection of plant and animal foods as well as snaring, but the storage of dry shellfish was probably paramount. Depending on the resource availability and foraging decisions taken at each site (see above), fish could also have been dried and stored. As already suggested in Chapter 3, storing could also have involved the preservation of energy-rich foods such as animal fat (seal and whale blubber) and plant carbohydrates of both terrestrial and marine origin. There is certainly no evidence for storage pits in the archaeological sites studied here, probably because these were not needed. The preservation of animal fats would have been undertaken in the cold and salty environment of wet sand found next to the beach (Smith *et al.* 1992), and the storage of shellfish, fish and plant food would have been easily facilitated by wooden racks built above ground in covered areas, to keep the stores dry. In both instances, storage pits near domestic areas are clearly not needed.

But, why storing? There seems no reason to believe that the processing and drying of food resources was not known before the megamidden period. Thus, no technological innovation need be invoked here. Storing allows for reorientation in the management of subsistence risk when a high degree of mobility is no longer possible or becomes infrequent (Testart 1982; Hall 1990: 24), as was the case in the study area sometime from 3500 to 3000 BP until about 2000 BP. Shellfish (black mussel) drying and storing during the megamidden period helped mainly to bridge seasonal constraints in the accessibility to marine protein imposed by summer red tides and stormy winter weather. It is assumed that terrestrial environments, or the natural availability of limpet colonies in the case of red tides, could not have absorbed the totality of this demand.

Food sharing appears to become less common with the development of food storage (possibly sea mammal meat, shellfish and plant food) during this period, as both may imply almost opposite social attitudes and mentalities (Testart 1982: 526). Furthermore, if food reserves are privately appropriated at a group and/or family level, it should be expected that sharing practices would drop between and/or within groups, because the economic advantage of the former is comparatively greater within the context of circumscribed mobility. This might be partly reflected in the study area by the drop in the numbers of large to medium large bovids (to which rules of food sharing observed for many southern San foragers generally apply) between 3500 and 2000 BP. On the other hand, social rules regarding food sharing are disregarded in the case of small mammals and gathered resources (Barnard 1992), which are precisely the types of resources that are emphasized in hunter-gatherer diet during the same period of time.

Frequencies of large game were already in decline during the Pleistocene/Holocene transition (Klein & Cruz-Uribe 1987). In this case, their diminishing numbers in the local archaeological record were to a large extent a consequence of major and less favourable palaeoclimatic changes. What is suggested here is that the progressive economic changes that lead to the choice of highly predictable and reliable resources (both marine and terrestrial) between 3500 and 2000 BP contributed to bring the frequencies of large and mobile game to below the frequencies reached during the early Holocene in the archaeological record. Thus, this new risk management strategy (consisting of targeting highly productive and predictable resources in space and time) interfered with the social rôle that meat sharing was likely to have had in the past, which today is known to be group cohesion and harmony (Marshall 1976; Lee 1979; Silberbauer 1981). This interference occurred at a time when social stress was at a rise (Chapter 6). As already suggested in previous chapters, the solution to these unsettling levels of tension, that were no longer resolvable through meat sharing, may well have involved the definition, continuation and reinforcement of formalized and spatially centralized ritual occasions at Steenbokfontein Cave. As a place with powerful meaning(s) to the groups who visited it, Steenbokfontein Cave acted as a pivotal element in bringing social tension and inter-group conflict to a manageable level.

It is also worthy of notice that the labour and scale of exploitation evidenced by the enormous size of megamiddens are not likely to have been the result of occasional visits to the shoreline by some members of family groups. The scale of marine exploitation during the megamidden period was large, and because of this, had to be organized. Which groups had access to which shellfish beds and when? How were people to proceed in the activities related to shellfish processing such as the collection of firewood for the generation of hot coals and the building of storage facilities? Similar questions can be posed regarding other subsistence activities such as snaring, the target of which is the capture of small bovids that are also highly localized because of their territorial behaviour. All of these concerns make reference to decision-making and someone with the authority to exercise it (Fig. 8.2).

Although speculative, it is suggested that the local hunter-gatherer social structure had to have accommodated the emergence of personalities responsible for the coordination of these activities between and within groups. This is not to suggest drastic status differentiation, social ranking and inequality amongst coastal hunter-gatherer groups (e.g. see Price & Brown 1985: 12). Rather, it is proposed that there was an emergence of incipient leadership rôles that were essential for resolving possible conflict and tension at an intra- and inter-group level in matters related primarily to subsistence strategies and possibly others (see below). The transition referred here is likely to be that from a non-hierarchical to a "sequentially hierarchical" social organization as suggested by Johnson (1982: 402-404), which is correlated with an increase in the size of the "basic social unit", as suggested previously for the research area (Chapter 6). The latter configuration would have worked as a mechanism for reducing the "communication load" on and between individuals. The presence of these emerging leaders during aggregation phases at Steenbokfontein Cave might also have been of importance for the successful mediation of social stress and the reinforcement of spiritual cohesion and harmony amongst groups. Thus, it is in these two arenas, the economic and ceremonial, where personalities with the ability to offer solutions to potentially conflicting situations were forged (Fig. 8.2).

Egalitarianism amongst southern San hunter-gatherers is often underlined by various ethnographers and is also frequently assumed uncritically by archaeologists when formulating interpretative frameworks (Chapter 2). Nevertheless, also in the ethnographic record are examples of emergent leaders in the form of charismatic ritual specialists (Guenther 1975, 1975/76) and political representatives (Lee 1979; Hitchcock 1982) within San communities. The use of headmen outside these communities, who provide a legal umbrella for the resolution of disputes (Lee 1979; Hitchcock 1987), has also been described. It is indeed true that in each of these cases the development of leadership rôles to varying degrees within San groups, and the use of headmen from outside their community, has come as a consequence of contact situations with food producers. Nevertheless, the point is that San hunter-gatherer themselves felt the need for leadership under situations of social stress, a phenomenon that is repeated in many societies across the cultural spectrum regardless whether stress originated as a consequence of a contact situation or not (Laughlin & d'Aquili 1979: 295-297). Consequently, the emergence of incipient leadership and the formalization of highly ritualized gatherings at Steenbokfontein Cave suggest a move towards increasing social complexity amongst coastal hunter-gatherers in the study area during the megamidden period.

Population growth and reduced mobility were also important conditions for changes in coastal hunter-gatherer communities in the research area, but these cannot be disentangled from social variables. Certainly, "...greater numbers of people create, not eliminate, problems" (Price

& Brown 1985: 10). The reason why people started circumscribing their mobility range along the coastal margin is difficult to ascertain, and the chronological resolution of the available sequences is not ideal for answering this question yet (see below for a suggestion). Although population growth is a relevant factor in the development of processes related to hunter-gatherer economy and settlement (this and previous chapters), the latter are not entirely explained by the former. If population growth had been the most important factor for these changes to happen, then we should not expect to find an absence of occupation in coastal caves between 3000 and 2000 BP. The more people that are present in an area, the more need there is for suitable places to settle. People clearly did not respond in that way. Hence, although relevant to hunter-gatherer intensification in the research area, population growth seems not to have been very critical.

As Hall (1990) has already suggested, the social problems generated by increasing sedentism are also accommodated through the intensification of ritual which ties people's identification and permanence around places and landscapes with powerful symbolic meanings. This factor can also feed positively into further increasing the local population numbers. Frequent ceremonial and gregarious ritual activities at Steenbokfontein Cave (ritual intensification) might have accomplished precisely this after local population levels started to increase and mobility ranges were constrained around 3500 BP. Alternatively, and more difficult to prove with "hard evidence", longer residencial permanence and greater circumscription of mobility could have taken place before population increase as a result of people's "attachment" to a landscape, which in turn was a consequence of having imprinted it with new and important social meanings by its inhabitants. The motives behind such possible behaviour are yet to be determined, and a considerable amount of work would have to be done before an outline of these particular factors could be defined.

Whatever the reason for and timing of this reconceptualization of the local landscape might have been, it is likely to have contributed to reformulate, recreate and reinforce group identity and a desire to remain at "the place where they belong". Population numbers may well have increased as a consequence of geographical circumscription and greater residencial permanence. Ritual intensification would have framed the social obligations within and between local groups, all of which were subjected to rising levels of stress. As a result of ritual intensification, the threshold under which people were prepared to live closer to each other would have been raised. "Intensification, therefore, is not simply a process of increasing economic production. It is a socially constructed strategy which is underwritten in the ritual sphere. In fact, the two cannot be separated" (Hall 1990: 9). Consequently, population increase can trigger, but not specifically determine, a series of options for intensification with economic and socially mediated responses (Fig. 8.2).

But there are those who would regard ritual as an epiphenomenon of population pressure (Cohen 1985), or as a masquerade of underlying political tussles and competition amongst hunter-gatherer social groups (Lourandos 1988: 150), and/or as a result of increasing social obligations amongst them (Bender 1978). Reasons for the existence of competition and demands derived from social obligations clearly independent from population pressure have not been possible to establish from the southern African context (Mazel 1989; Hall 1990), let alone for a really convincing case from the pre-domestication archaeological record in general (Price & Brown 1985: 15). It is possible that this observation might also respond to the inherent "coarseness" (spatial and chronological) of the archaeological record.

Clearly, it is not yet possible to separate the environmental, demographic and social variables when explaining intensification. Thus, the claim for the primary influence of one factor above the others has to await a better resolved chronological record, or purist interpretative frameworks based on single favoured ideological or intellectual positions will have to be dropped. The adoption of a "theoretical twilight", where a more eclectic approach is applied (Marquardt 1985: 84), might offer more fruitful avenues for future research in this respect.

The time of contact: informed speculations for encouraging further lines of research

Woodburn (1988) has suggested that it would have been possible to study many more hunter-gatherer societies practicing an economy based on delayed-returns if it were not for the destructive consequences of colonialism and the transforming presence of food producers. A higher proportion of those hunter-gatherer societies based on immediate-returns would have coped better with these incursions and survived because of their relative "flexibility". He also suggested that several of the immediate-returns hunter-gatherer groups studied by ethnographers might be the result of the breakdown of delayed-return systems, as these developed a new form of organization (oppositional solidarity) for opposing outsiders (Woodburn 1988: 61-63). Nevertheless, Woodburn (1990: 63-64) also gives reasons for the first path of changes to have been more plausible than the second. The relevant point here is that hunter-gatherer societies committed to an economy of delayed-returns are generally more vulnerable to the influence of neighbouring pastoralists and agriculturalists than those who practice an immediate-return economy. "Delayed-return hunter-gatherer systems are, in a sense, pre-adapted for the development of agriculture and pastoralism" (Woodburn 1988: 63), whilst the ability of people with immediate-return systems to grow crops and keep animals is seriously inhibited by elaborately sanctioned rules and values which are strongly focused on sharing.

Towards the end of the megamidden period, hunter-gatherers were still engaged in a system of delayed-returns, and levels of social stress, and perhaps also ecological stress, were probably higher than ever before. One of the coping mechanism based on intensified ritual at this time was no longer offering an adequate response to such stress (Chapters 6 and 7). This lack of alternatives might have made this society more vulnerable to assimilation by an outsider group, as new ideologies could have been perceived better suited for regulating high levels of stress (Laughlin & d'Aquili 1979). Furthermore, the "aseasonal" character (because of storage) of the coastal hunter-gatherer economy in the research area (see Hall 1990 for a similar case of the eastern Cape) was not far removed in concept from the aseasonal access to subsistence means through stock keeping. In fact, both economies are based on the accumulation of surplus. Moreover, if relatively strong leadership rôles developed immediately before and/or after contact in the form of powerful shamans, who might have acted as rain-making specialists and accepted livestock for their services (Campbell 1987; Hall 1986, 1990, 1994; Kinahan 1991; Dowson 1994), then this might have been another factor (working from within the group) for a faster transformation of some hunter-gatherer societies. Thus, the adoption of stock and herding skills from incoming pastoralists by hunter-gatherers in the western Cape might not have been as difficult as has been suggested until recently (Parkington *et al.* 1986; Smith 1986, 1990).

Smith's insistence on the substantial ideological and organizational difficulties for hunter-gatherers to adopt pastoralism, even in a most rudimentary way, is based in the misapprehension that all hunter-gatherer communities at the time of contact around 2000 BP were practicing an immediate-return economy. Nevertheless, Smith admits that the adoption of stock "... could happen among hunters, but under special conditions where there would be a surplus that could be stored and thus controlled" (Smith 1990: 56). Following this line, Webley (1992) also suggested that hunter-gatherer groups must have undergone structural changes in order to become pastoralists. Unfortunately, no archaeological evidence supporting such a social scenario has emerged from her work in the northern Cape.

The social landscape encountered along the western Cape by incoming pastoralists is likely to have been very diverse, including hunter-gatherers committed to immediate-return and

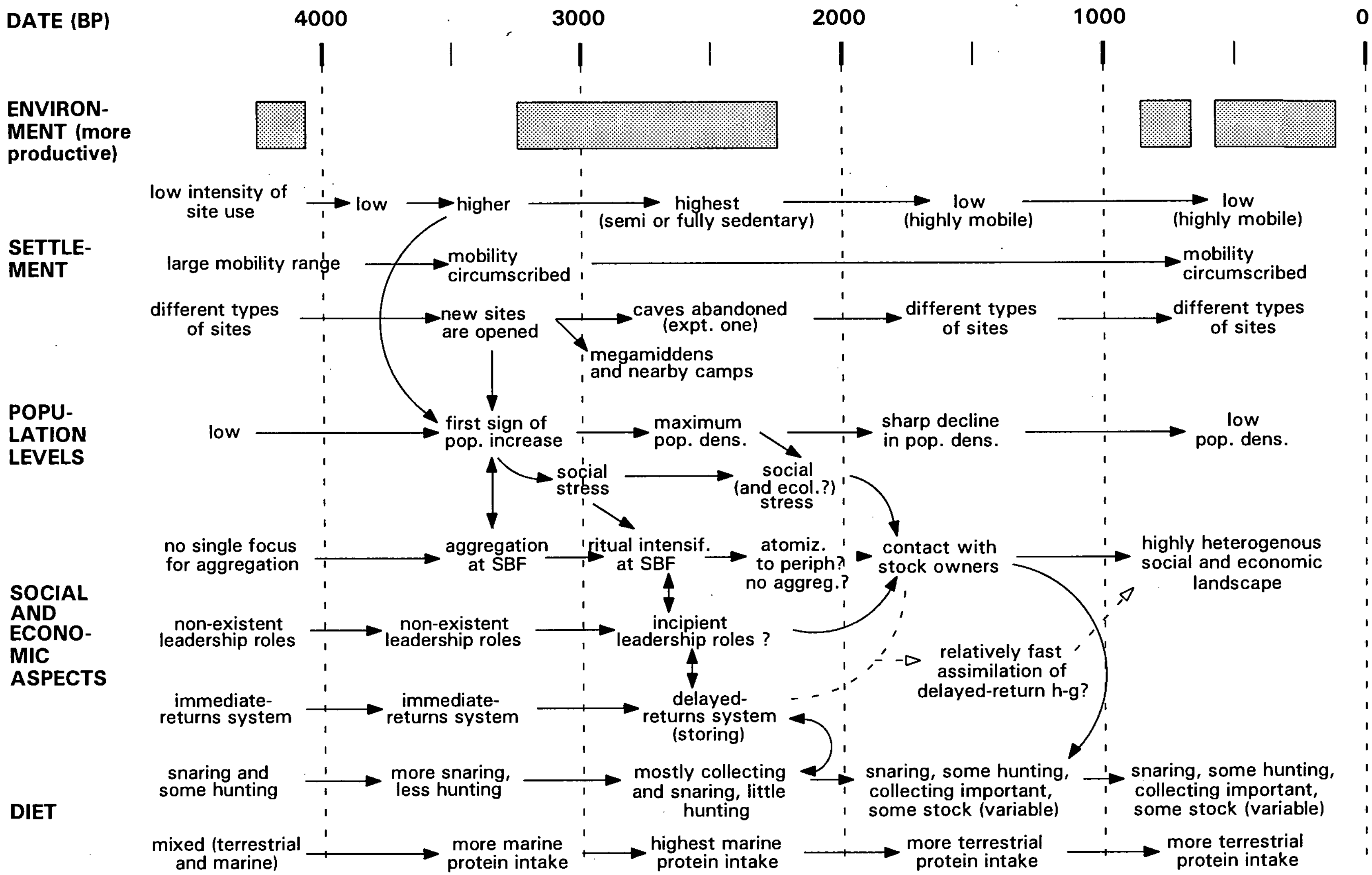

Figure 8.2: Diagram showing the relationship amongst observed variables and the resulting social, economic and cultural processes in the study area. This diagram is a highly summarized version of events and developments, and therefore needs to be read in conjunction with the text.

others to delayed-return economies (see Kent 1992 for a similar point regarding present-day Kalahari). Consequently, the outcome from this multiplicity of contact situations might have also resulted in very diverse responses, such as: conflict and mutual avoidance (Parkington 1987a; Parkington *et al.* 1986), clientship and cooperation, assimilation by intermarriage (Jolly 1994), and the adoption of stock by some of the coastal hunter-gatherer groups in the research area. A combination of these possible upshots may well have accelerated the process by which the social landscape in the western Cape was changed before European contact and, hence, before written records (Fig. 8.2).

There are good indications that the archaeological record of the western Cape dating to the last 2000 years changed at a much faster rate, and somewhat differently, in the coastal region than in the interior mountain as a result of the introduction of pastoralism (Yates *et al.* 1994; Yates in prep.). One important factor behind these differently paced cultural trajectories can be attributed to particular sets of economic and social processes developing in each region that were limiting and/or determining the types of outcome from contact situations. The mountain and coastal hunter-gatherer groups seem likely to have been at variance in this respect (Yates *et al.* 1994). The different configuration of settlement and subsistence systems, group organization, and level of inter-group interaction, as well as the general preference for coastal environs by herders (Smith 1986), are likely to have made coastal hunter-gatherer communities more susceptible to assimilation and/or transformation (Fig. 8.2).

These hypothetical cultural and social trajectories need to be tested with further research in the coast, Sandveld and inland areas. In particular, there is a need to increase the number of observations dating to immediately before and after 2000 BP in each of these regions. It is also important to devote some serious attention to the development of alternative interpretative frameworks that should consider the diversity observed amongst prehistoric hunter-gatherers, and their capacity of becoming <u>active</u> rôle players in the transformation of their society and history.

SUMMARY:

Changes in the subsistence trends of coastal hunter-gatherers are very consistent from site to site and through time despite variations in site function (aggregation and dispersal sites) and season of occupation. The onset of these changes dates to before the megamidden period around 3500 BP and ends with the appearance of the pastoralist economy around 2000 BP.

During this 1500 year long period, the exploitation of marine resources, particularly shellfish, was most important. The result of this significant effort was largely directed to the creation of surplus in the form of dried shellfish (black mussels) and possibly dried fish, if not also plant food. As an outcome of this particular subsistence activity, coastal hunter-gatherers were engaged in an economy of delayed-returns. Shellfish was also an important component of hunter-gatherer diet on a daily basis.

As population numbers and group size expanded, the mobility range was reduced and life became more sedentary, if not fully so, for coastal hunter-gatherers during the same period (Chapters 6 and 7). Right at the onset of this process, people are likely to have become identified with the area where they stayed, as intense ritual activity needed for the mediation of rising social stress was focused at a particular point in the landscape (Steenbokfontein Cave). People would have resorted to this place for the reinforcement and maintenance of social and spiritual metaphors (Chapters 6 and 7), which are at the base of group and/or cultural identity (J. Deacon 1988; Ouzman 1995). Incipient leadership would have developed along social and economic needs, where decisions regarding the coordination of subsistence activities and social mediation of stress and conflict had to be taken within and between groups.

The subsistence adjustments that accompanied these demographic and social changes affected also the exploitation of terrestrial resources, and not just those found in marine environments. From 3500 to *c.* 2000 BP, the collection of tortoises and plant food was markedly emphasized, and snaring of small and territorial ungulates was preferred above hunting large and highly mobile game. These results point to an economy based on highly predictable, low-risk, low effort and reliable resources, as well as storage. These characteristics are in agreement with a scenario of resource intensification in the research area.

The last 2000 years saw a return to some of the subsistence patterns dating to before 3500 BP, with a rise in hunting large game, a significantly smaller contribution of tortoise relative to mammal, and an overall emphasis on terrestrial resources. Nevertheless, plant collection might have still remained an important dietary component, as reflected by their conspicuous presence in the archaeological record and the prominence of adzes in stone tool inventories (Chapter 7). Changes in palaeodiet as inferred from the archaeological remains are in agreement with previous isotopic assessments where the contribution of proteins and energy-rich food have been broadly discriminated (Lee-Thorp *et al.* 1989). It is also important to emphasize that a proper reconstruction of the social and economic trends present immediately before the introduction of pastoralism (that is, during the megamidden period) are essential for a better understanding of the particular cultural trajectories that were triggered as a result of this contact.

CHAPTER 9
CONCLUSIONS

In this thesis, an attempt has been made to provide a new synthesis of the late-Holocene archaeology of the Eland's Bay and Lambert's Bay areas. This attempt involved i) the procurement of a new set of observations (archaeological and palaeoenvironmental), which included time slices about which little was known, ii) a number of new dates from sites excavated before the undertaking of this project, iii) a different interpretative framework to that guiding previous archaeological reconstructions in the study area, iv) and new methodological (analytical) approaches developed as a consequence of this different theoretical perspective.

Venturing outside the use of ethnographic analogies based on San hunter-gatherers, and breaking through the logic path dictated by normative thinking, has allowed new insights into the Late Stone Age archaeology of the western Cape. What has been searched for in this study is a coherent reconstruction of a *changing past*, as opposed to timeless generalizations regarding the ecological determinants in hunter-gatherer lives, which emphasize stasis and lack of innovative qualities from within the society. This ..."historicism allowed by a social approach assumes [the possibility of] change both between present and past and between different contexts in the past" (Hall 1990: 276). As with other studies (Mazel 1989; Hall 1990), an effort has been made in this thesis to uncover variability in extant hunter-gatherer groups beyond the ethnographic record. This has been attempted by making an emphasis on modes and relations of production and less so on the means of production, since the former often constitute a source of social tension and change. Another guiding concept in this thesis is the reasonable assumption that hunter-gatherer population levels might not have remained unchanged through long periods of time, and that growing numbers of people would have posed challenges to the society that they represented.

Such an historical and social framework might be suspected by some archaeologists to be incompatible with any attempt to use ethnographic analogs and the undertaking of palaeoenvironmental studies. This is actually not the case. First, criticisms regarding the use of ethnographic analogies do not call for a total abandonment of such practices, but rather to exercise them with caution, treating them as starting hypotheses, and hoping to provide evidence for their support or rejection. Second, because the objective of the approach adopted here is to uncover variability, it has to be allowed that there might have been times and places in which *changes* in the relations of production and/or population levels did not contribute significantly in shaping the archaeological record. In these cases, ethnographic analogies regarding band/land economics and egalitarian practices among hunter-gatherer groups might (or might not) provide appropriate interpretative tools for a coherent reconstruction of particular archaeological records. The possibility that some aspects of particular hunter-gatherer societies might have suffered little change for several centuries or millennia, whilst others might have undergone profound changes has also to be allowed. Thus, breaking through the mind set brought about by normative thinking does not favour a particular theoretical perspective or particular solutions for the interpretation of any sequence. Dropping normative thinking gives archaeologist the necessary freedom to allow for a past, that differs from that of ethnographic accounts, to have happened, whilst also looking for maximum coherence between the body of observations and his or her interpretations. Third, as shown in this thesis, palaeoenvironmental studies that offer reconstructions with appropriate chronological resolutions in relation to particular study cases can provide observations that rule out strict ecological determinisms.

The following paragraphs summarize the late-Holocene archaeological sequence of the Lambert's Bay and Eland's Bay areas (see also Figure 8.2). A few suggestions for further research are presented at the end.

4300 - 3500 BP

Around 4300 BP, the study area was re-occupied after an apparent period of infrequent visits during the mid-Holocene. Shortly after this date, both marine and terrestrial environments became relatively productive, and a short-spanned sea level regression, following a mid-Holocene high mark of 2-3 meters a.m.s.l, took place around 4200 BP. A range of different types of sites located at varying distances from the shoreline were chosen for habitation during this period. Sites were occupied intermittently by relatively small groups of people, which also stayed for relatively short visits. Apparently, no site was singled out as a focus of aggregation for hunter-gatherers. Mobility included a range large enough to have reached areas where stone raw materials, exotic to the coastal margin, are found. The economy was characterized by a system of immediate returns, and the subsistence was procured by snaring and hunting, plant and shellfish collection. As a result, hunter-gatherer diet was mixed (terrestrial and marine origin).

3500 - 3000 BP

Marked changes were experienced in certain aspects of hunter-gatherer society, whilst others remained as before, during this short period. First signs of population increase and longer residencial permanence happened around 3500 BP. From this date onwards, mobility was also circumscribed within the study area, and some parts of the wider coastal Sandveld, along a north to south axis. Social stress was likely to have become manifest, as a consequence of the increasing number of people and their apparent decision to stay within a circumscribed area. Peoples' apparent reluctance to resolve social tension by moving away from the study area might have been reinforced by a strong sense of identity with the place (a landscape) where they stayed. From 3500 BP onwards, Steenbokfontein Cave was used as an aggregation centre for ceremonial and social activities which helped to mediate inter-group conflict and lower the levels of tension originating from more people sharing the same space. An immediate return economy continued to be practiced, although more shellfish collection and consumption, as well as more snaring of small antelopes and less hunting of large game, characterized the subsistence of coastal hunter-gatherers. The marine and terrestrial environments became increasingly more productive towards the end of this five hundred year long period, and a second sea level regression, possibly to the present mark, was also contemporary with these changes.

3000 - 2000 BP

Hunter-gatherer society experienced further changes as a consequence of the process described above. Population numbers continued to increase, reaching maximum levels during this millennium, partly allowed by propitious environmental conditions. Marine and terrestrial productivity, however, started to drop after *c.* 2400 BP. Increasing population densities prompted people to reconfigure their settlement and subsistence, although ecological stress was not expressed before 2400 BP. Settlement became more sedentary and shifted almost exclusively to large open sites (megamidden). With the exception of Steenbokfontein Cave, no other cave site was visited throughout most of this period. The subsistence strategy consisted of an overall emphasis on low-effort and low-risk food procurement, targeting highly predictable and productive species in both marine and terrestrial environments. The economy was organized to a significant extent within a system of delayed returns, whereby storing became most important for the procurement of protein during periods when it was more difficult to obtain (e.g. summer red-tides and stormy winter days). The large scale exploitation to which marine resources were subjected during the megamidden period might well have prompted the emergence of incipient leaders responsible for the organization and/or coordination of this enterprise. People vested with this authority might also have been responsible for resolving possible intra- and inter-group conflict and tension during non-gregarious phases. The collection of underground plants and tortoises became more emphasized during the megmidden period than ever before during the late-Holocene. Snaring was still undertaken, to some extent, for the acquisition of ungulate meat. Hunting of large bovids was practiced only on rare occasions.

Intensification of communal ritual activities continued to be undertaken at Steenbokfontein Cave during the megamidden period. With the repetition of these special occasions, it is likely that this site became embedded with important and powerful meanings for the people who visited it. Communal gatherings at Steenbokfontein Cave not only acted as a pivotal element in bringing intra and inter-group conflict to a minimum, but were probably instrumental in reinforcing the authority of incipient leaders.

The pervasive levels of social stress and the beginnings of ecological stress after 2400 BP could no longer be mediated through ritual and the use of some authority by incipient leaders. As a consequence, Steenbokfontein Cave ceased to be a centre of aggregation after 2400 BP, although it continued to be visited until 2200 BP. Either a different place was chosen for the same purposes or a more radical solution to the increasing problems related to social and ecological stress was sought. The latter might have involved the dislocation of previous social networks amongst hunter-gatherer groups in the research area through group fission into smaller social units, a withdrawal by some groups to the periphery of the study area, and an emphasis in territorial behaviour.

after 2000 BP

Changes were once again experienced in every aspect of hunter-gatherer life after 2000 BP. These seem most likely to be related to the first series of encounters with stock owners which also introduced ceramics to hunter-gatherer material culture. It is also likely that local hunter-gatherers practicing a delayed return economy (storing) based on wild foods (mainly shellfish) might have undergone, to varying degrees, relatively fast assimilation into the incoming pastoralist society practicing a food-producing economy. The similarity of the relatively "aseasonal" character of both of these economies, the need for a new solution to social and possibly ecological stress and the presence of community leaders amongst hunter-gatherers might well have helped in this process of transformation. Other groups, that might have switched back to a more immediate return economy towards the end of the megamidden period, followed other paths of interaction, involving loosely defined clientship with stock-owning groups, intermarriage, conflict and/or avoidance with pastoralist groups. Thus, the social and economic landscape in the study area is likely to have been very diverse in space and time after 2000 BP. The archaeological record dating to this period of social re-adjustments shows that population densities declined sharply immediately after 2000 BP. A variety of different types of sites (once again including caves) were visited by small social units staying for relatively short time. Mobility was still restricted to the coastal plain along a south to north axis and, possibly, to the adjacent Sandveld. Subsistence was organized mostly around snaring of small bovids, plant and tortoise collection, shellfish gathering (at a much smaller scale than during the megamidden period), and hunting of large bovids to some extent. Small scale stock-keeping and/or the stealing of animals from neighbouring pastoralists (Parkington 1984a) was also practiced. Diet became overall more mixed, whereby protein was obtained largely from non-marine resources.

This concluding summary is by no means a definitive statement regarding the late-Holocene archaeology of the Eland's Bay and Lambert's Bay areas. Much has still to be done, and further research should test the conclusions arrived at in this thesis. Excavations at Steenbokfontein Cave and Pancho's Kitchen Midden should continue in order to increase the sample size of artefacts and faunal remains, and subsequently re-assess their sequences and compare them with those reconstructed in the previous chapters. This is particularly true for the period dating to the end of the megamidden period, for which only a handful of observations are available. Along the same line of enquiry, a larger number of observations should be obtained from already sampled megamiddens and also from others still awaiting to be characterized. A new look at the late-Holocene sequence of Eland's Bay Cave following the methodological approach employed in Chapters 6, 7 and 8 will also provide an appropriate test case. Excavations in caves not previously investigated should not only be aimed at the same purpose. It is also important to determine whether any other cave (at the coast, Sandveld or interior mountains), besides Steenbokfontein Cave, was visited regularly between 3000 and 2000 BP, and if so, to determine the character of its occupation.

The sequence of events and their possible causes proposed for the study area needs to be compared with that of other regions. We need to know whether or not hunter-gatherer groups that visited the coastal areas north of Lambert's Bay and south of Eland's Bay, as well as the interior Sandveld and mountains, underwent a similar history of social change to that of the study area. Whichever the answers might be, the search for an explanation regarding the possible differences or similarities will add to our knowledge about the variability amongst hunter-gatherers through time and space.

In this thesis, it was suggested that the social organization of production during the megamidden period was different to that before and after this millenium. We need to know more about this aspect, particularly regarding the level at which the production and surplus was controlled. It is also relevant to ask whether the so-called "typical" hunter-gatherer sexual division of labour ("men-hunt/women-gather") underwent significant changes during the megamidden period, as little hunting was done during this time, and most of the food was procured by collecting and some snaring. How does one recognize incipient leadership in the material record beyond suspecting its presence from the scale at which the production was organized? If they existed towards the end of the megamidden period, did incipient leaders among some hunter-gatherer communities add to the process of assimilation into pastoralist society, even though this might have ended up disempowering them? Although some ideas have been offered as to how local hunter-gatherers might have begun to keep stock at a small scale, little is known about the social mediations through which ceramics were accepted amongst the same local groups. These are some of the many challenges that are still facing us in our attempts to reconstruct the pre-colonial past of the western Cape.

APPENDIX 1

PANCHO'S KITCHEN MIDDEN: RESULTS OF OXYGEN ISOTOPE ANALYSES ON *Patella granatina*

LAYER	UNIT	SQUARE	SAMPLE	$\delta^{18}O$
1	LATINA	M7	A	1.49
1	LATINA	M7	B	1.22
1	LATINA	N7	A	1.65
1	LATINA	N7	B	1.47
1	LATINA (l)	N7		1.58
1	TACO LOWER	K5	A	1.56
1	TACO LOWER	K5	B	1.36
1	TACO LOWER	K5	C	1.60
1	TACO	L6		1.54
2	LIMARI	L7	A	1.53
2	LIMARI	L7	B	1.76
2	MISTERIO	K5		1.60
2	MISTERIO	L6		1.19
3	TEMPRANO	N7		1.42
3	TEMPRANO	L7	A	1.52
3	TEMPRANO	L7	B	1.52
3	TEMPRANO	L7		1.62
3	TEMPRANO	L6		1.71
4	SBTG	L7		1.28
5	CAFE II	M7		1.15
5	SH. IN CAFE	N7		1.36
6	PENCO III	M7	A	1.60
6	PENCO III	M7	B	1.34
6	PENCO (u)	N7		1.51
6	PENCO (u)	N7		1.29
6	TSB	L7	A	1.60
6	TSB	L7	B	1.42
7	SH.PANCHO I	N7	A	1.15
7	SH.PANCHO I	N7	B	1.36
7	SH.PANCHO II	N7		1.09
7	SH.PANCHO I	L7	A	1.62
7	SH.PANCHO I	L7	B	1.44
7	SH.PANCHO I	L7	C	1.21
7	SH.PANCHO II	L7	A	1.16
7	SH.PANCHO II	L7	B	1.15
7	PANCHO II	M7		1.40

APPENDIX 2

WEIGHT, COUNTS AND DENSITIES OF FAUNA, CHARCOAL AND ARTEFACTS

Weights (w) are quantified in grams or kilograms, and densities (d) are either expressed as mass per bucket (g/bkt or kg/bkt$^{\mu}$), numbers of artefacts per bucket (n/bkt) or minimum number of individuals per bucket (mni/bkt$^{\emptyset}$). Table 4.2 provides volume observations for the calculations of densities. Weights of calcined materials were corrected for loss of mass according to experimental values (Jerardino & Yates 1996). Shell densities were calculated from analyzed bulk samples, and consequently, shell weights represent only part of the excavated shell material. Observations on weight and density values for megamidden sites were partly obtained from samples and partly from material recovered from sorting the totality of excavated volume. Asterisk (*) indicates no available data, and a dash (-) indicates none present.

TORTOISE CAVE:

LAYER	TORTOISE		MAMMAL		OES		FISH		CRAYFISH$^{\emptyset}$	
	w	d	w	d	w	d	w	d	mni	d
1a	1153.1	9.2	759.0	6.1	47.1	0.4	67.0	0.5	6	<0.1
1b	309.1	8.0	440.0	11.5	27.8	0.7	313.1	8.1	13	0.3
2a	799.0	10.5	2304.5	30.3	62.3	0.8	1302.3	17.1	20	0.2
2b	708.8	7.4	1353.2	14.1	387.2	4.0	1956.7	20.2	47	0.5
3a	747.7	7.1	1213.9	11.6	214.1	2.0	1996.4	19.1	57	0.5
3b	662.3	6.3	1222.2	11.6	107.2	1.0	2615.1	24.9	42	0.4
5	246.8	4.5	278.7	5.0	20.1	0.3	47.4	0.8	15	0.3
6	559.3	8.9	626.4	10.0	60.1	0.9	183.8	2.9	42	0.7
7	463.3	8.9	454.4	8.8	62.1	1.2	126.1	2.4	23	0.4
8	318.7	10.5	208.0	6.8	38.8	1.3	46.1	1.5	12	0.4
10	1547.0	25.8	2741.5	45.7	140.8	2.3	2064.2	34.5	11	0.2
11	845.8	11.2	1267.2	16.8	84.5	1.1	892.6	11.8	12	0.1
13a	1767.6	24.9	1581.4	22.3	145.6	2.0	996.2	14.0	8	0.1

LAYER	CHARCOAL		PIGMENT MATERIAL		FLAKED STONE ARTEFACTS		UNFINISHED OES BEADS		FINISHED BEADS AND PENDANTS	
	w	d	w	d	n	d	n	d	n	d
1a	*	*	14.3	0.1	159	1.3	-	-	43	0.3
1b	*	*	4.6	0.1	47	1.2	3	0.1	20	0.5
2a	*	*	24.2	0.3	54	0.7	1	<0.1	18	0.2
2b	*	*	28.7	0.3	98	1.0	7	0.1	57	0.6
3a	*	*	63.5	0.6	164	#2.1	18	0.2	117	1.1
3b	*	*	564.3	5.3	488	4.6	8	0.1	141	1.3
5	*	*	3.0	<0.1	571	10.3	14	0.2	33	0.6
6	*	*	34.3	0.5	936	15.0	22	0.3	27	0.4
7	*	*	22.6	0.4	921	17.8	16	0.3	22	0.4
8	*	*	6.9	0.3	86	2.8	6	0.2	10	0.3
10	*	*	17.3	0.3	1925	32.1	11	0.2	16	0.3
11	*	*	27.7	0.4	709	9.4	11	0.1	31	0.4
13a	*	*	33.2	0.5	1293	18.2	17	0.2	9	0.1

#: Densities of stone artefacts for Layer 3a were calculated with a volume count of 76.8 bkts instead of that appearing in Table 4.2, as the lithic remains of a major unit (KTAT) have not been located, and it has consequently been excluded.

Appendix 2: cont.

PANCHO'S KITCHEN MIDDEN:

LAYER	TORTOISE		MAMMAL		BIRD		OES		FISH		SHELL$^{\mu}$	CRAYFISH$^{\varnothing}$	
	w	d	w	d	w	d	w	d	w	d	d	mni	d
1	1244.3	31.7	928.4	23.7	42.1	1.1	134.0	3.4	2.4	<0.1	8.4	1	<0.1
2	1202.6	50.8	114.5	4.8	3.1	0.1	11.5	0.5	3.5	0.1	5.2	-	-
3	298.0	8.3	75.3	2.1	3.5	0.1	3.4	0.1	6.5	0.2	7.2	-	-
4	602.7	11.2	432.8	8.0	6.7	0.1	38.4	0.7	191.8	3.5	6.7	-	-
5	470.1	16.5	124.3	4.3	19.2	0.7	10.0	0.3	7.6	0.3	5.3	-	-
6	1514.2	49.5	286.3	9.3	9.3	0.3	2.7	0.1	19.5	0.6	7.7	-	-
7	889.0	17.2	472.1	9.1	19.7	0.4	3.2	<0.1	9.0	0.2	4.7	-	-

LAYER	CHARCOAL		PIGMENT MATERIAL		FLAKED STONE ARTEFACTS		UNFINISHED OES BEADS		FINISHED BEADS AND PENDANTS	
	w	d	w	d	n	d	n	d	n	d
1	612.0	15.6	-	-	158	4.0	-	-	-	-
2	243.9	10.3	-	-	113	4.7	-	-	1	<0.1
3	288.4	8.0	-	-	243	6.8	-	-	4	0.1
4	1341.7	24.9	0.8	<0.1	322	6.0	-	-	4	0.1
5	548.3	19.2	2.3	0.1	190	6.6	-	-	6	0.2
6	485.7	15.9	1.5	<0.1	171	5.6	-	-	7	0.2
7	395.7	7.6	6.5	0.1	617	11.9	2	<0.1	3	<0.1

STEENBOKFONTEIN CAVE:

LAYER	MICROFAUNA		TORTOISE		MAMMAL		BIRD		OES		SHELL$^{\mu}$	CRAYFISH$^{\varnothing}$	
	w	d	w	d	w	d	w	d	w	d	d	mni	d
1	765.4	16.9	3611.2	79.9	917.1	20.3	81.9	1.8	65.3	1.4	2.8	27	0.6
2	918.9	25.5	1528.1	42.4	338.7	9.4	44.0	1.2	37.0	1.0	2.2	31	0.8
3	1139.4	10.4	8131.8	74.4	1342.8	12.3	292.6	2.6	155.3	1.4	2.5	151	1.3
4a	95.5	5.5	2626.4	105.6	1719.6	69.2	984.6	45.6	36.8	1.5	5.5	33	1.5
4b	585.0	15.0	1610.8	41.3	1739.9	44.6	506.2	12.9	30.3	0.8	1.5	91	2.3

LAYER	CHARCOAL		PIGMENT MATERIAL		FLAKED STONE ARTEFACTS		UNFINISHED OES BEADS		FINISHED BEADS AND PENDANTS	
	w	d	w	d	n	d	n	d	n	d
1	4381.7	96.9	163.8	3.6	397	8.8	2	2.9	3	4.3
2	3178.3	88.1	95.3	2.6	421	11.7	4	7.3	5	9.1
3	8391.6	76.8	340.4	3.1	1747	16.0	17	10.1	33	19.6
4a	609.6	24.4	56.7	2.3	764	30.7	2	5.2	12	31.6
4b	3784.8	97.1	191.7	4.9	730	18.7	8	13.3	9	15.0

Appendix 2: cont.

MALKOPPAN:

LAYER	FAUNA		SHELL$^{\mu}$	CRAYFISH$^{\emptyset}$		CHARCOAL		FLAKED STONE ARTEFACTS	
	w	d	d	mni	d	w	d	n	d
TOP MUSSEL	6.3	0.7	-	-	-	33.9	3.9	-	-
MIDDLE MUSSEL	0.7	0.1	3.0	2	0.3	3.3	0.5	-	-
BOTTOM MUSSEL	0.1	<0.1	-	-	-	2.2	1.1	-	-
B.B. MUSSEL	2.7	0.6	-	-	-	-	-	-	-
SANDY PARTING	4.3	0.3	1.2	4	0.3	-	-	1	<0.1
PGLR	37.9	1.8	0.5	12	0.7	6.5	0.1	14	0.6

GROOTRIF D:

UNIT	FAUNA		SHELL$^{\mu}$	CRAYFISH$^{\emptyset}$		CHARCOAL		FLAKED STONE ARTEFACTS	
	w	d	d	mni	d	w	d	n	d
1	2.6	0.7	*	4	1.1	*	*	4	1.1
2	8.9	1.8	*	9	1.8	*	*	-	-
3	3.1	1.5	*	6	3.0	*	*	-	-
4	43.3	13.9	*	50	16.1	*	*	3	0.9
5	12.7	9.1	*	34	24.3	*	*	1	0.7
6	41.1	20.5	*	62	31.0	*	*	3	1.5
7	19.4	12.1	*	23	14.4	*	*	2	1.2
8	57.2	10.2	*	53	10.0	*	*	-	-
9	1.1	0.5	*	1	0.5	*	*	-	-
10	1.8	0.9	*	11	5.5	*	*	-	-
11	3.6	1.7	*	2	0.9	*	*	-	-
12	4.6	4.6	*	2	2.0	*	*	-	-
13	0.6	0.1	*	1	0.2	*	*	-	-
14	7.4	2.9	*	4	1.6	*	*	2	0.8
15	20.3	2.1	0.9	6	2.8	12.2	5.8	1	0.5
16	3.1	1.6	*	4	2.5	15.1	9.4	-	-
17	0.8	5.5	*	1	0.2	*	*	-	-
18	48.4	7.3	1.7	40	5.0	26.0	3.2	4	0.5

CAPE DESEADA MIDDEN:

(test pit #1)

LAYER	FAUNA		SHELL$^{\mu}$	CRAYFISH$^{\emptyset}$		CHARCOAL		FLAKED STONE ARTEFACTS	
	w	d	d	mni	d	w	d	n	d
top lens	0.7	0.3	1.4	-	-	8.7	4.3	-	-
bottom lens	3.3	1.6	0.8	-	-	5.9	2.9	5	2.5

(test pit #2)

LAYER	FAUNA		SHELL$^{\mu}$	CRAYFISH$^{\emptyset}$		CHARCOAL		FLAKED STONE ARTEFACTS	
	w	d	d	mni	d	w	d	n	d
top lens	27.1	9.0	0.8	2	1.0	4.6	1.5	9	3.0
bottom lens	22.4	5.6	0.5	-	-	4.6	1.1	6	1.5

Appendix 2: cont.

RAILWAY MIDDEN:

LAYER	FAUNA		SHELL^µ	CRAYFISH^Ø		CHARCOAL		FLAKED STONE ARTEFACTS	
	w	d	d	mni	d	w	d	n	d
test pit #1	-	-	5.4	-	-	-	-	-	-
test pit #2	0.5	0.5	2.7	-	-	1.3	1.3	-	-

MIKE TAYLOR'S MIDDEN:

LAYER	FAUNA		SHELL^µ	CRAYFISH^Ø		CHARCOAL		FLAKED STONE ARTEFACTS		FINISHED BEADS AND PENDANTS	
	w	d	d	mni	d	w	d	n	d	n	d
BSS1	4.7	0.5	2.5	1	0.1	22.2	2.6	1	0.1	1	0.1
BSS2	4.2	0.7	*	-	-	27.0	4.9	-	-	3	0.5
BSS3	3.5	0.8	*	-	-	31.2	7.4	-	-	-	-
PSS1	4.1	0.7	3.5	-	-	43.2	7.7	-	-	-	-
PSS2	7.2	0.9	2.5	-	-	30.5	4.1	-	-	-	-
PSS3	4.1	1.1	1.9	-	-	31.4	8.5	-	-	-	-
PSS4	0.7	0.2	*	-	-	15.2	5.0	-	-	-	-
PSS4	-	-	*	-	-	3.3	2.2	-	-	-	-
FS1	3.7	0.5	*	1	0.1	71.2	10.1	-	-	-	-
FS2	0.4	0.4	6.3	-	-	26.4	13.2	-	-	-	-
FS3	1.7	1.7	7.9	-	-	42.2	21.1	-	-	-	-
FS4	0.1	<0.1	*	-	-	33.6	16.8	-	-	-	-
FS5	4.2	2.1	7.3	-	-	25.7	12.8	-	-	-	-
FS6	1.5	0.7	*	-	-	16.0	8.0	-	-	-	-
FS6b	6.0	3.0	7.6	-	-	13.6	6.8	-	-	-	-
WS1	0.2	0.1	*	-	-	23.3	11.6	-	-	-	-
WS2	2.4	2.4	5.0	-	-	20.0	20.0	-	-	-	-
WS3	12.6	5.2	*	-	-	38.7	16.1	-	-	-	-
GFS1	1.6	0.8	*	-	-	48.3	24.1	-	-	-	-
BARN1	24.6	8.5	*	-	-	39.9	13.7	-	-	-	-
GFS2	1.1	1.2	6.5	-	-	4.1	4.7	-	-	-	-
BARN2	5.7	1.7	*	-	-	33.4	10.2	-	-	-	-
GFS3	2.0	1.4	*	-	-	16.3	11.6	-	-	-	-
BARN3	1.2	0.6	5.1	-	-	20.0	10.0	-	-	-	-
DGM	0.1	0.1	4.0	-	-	45.0	45.0	-	-	-	-

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