From: Hans-Peter Wotzka (ed.), Grundlegungen. Beiträge zur europäischen und afrikanischen Archäologie für Manfred K. H. Eggert (Tübingen: Francke, 2006) 329 – 355.

Nicholas J. Conard and Andrew W. Kandel

The economics and settlement dynamics of the later Holocene inhabitants of near coastal environments in the West Coast National Park (South Africa)[1]

Introduction

Recent years have seen lively debate on the archaeology of hunter-gatherers and herders in the Western Cape. Smith et al. (1991) stress the distinct nature of these economic and cultural systems, and thereby argue that herders, accompanied by sheep and using pottery, first entered the Western Cape about two thousand years ago. Sadr (2004) has countered that the distinction between hunter-gatherers and herders is less clear-cut. He suggests that sheep herding could have arrived without a major migration of people, and that there was considerable interaction between both cultural groups. The various points of view and archaeological background to this debate have been summarized in recent publications (e.g., Sadr et al. 2003; Sadr 2004; Parkington & Hall in press), and this question is discussed in reports on pottery (e.g., Sadr & Smith 1991; Sampson & Sadr 1999), fauna (e.g., Klein & Cruz-Uribe 1989; Smith 1998; Webley 2002), human skeletal data (e.g., Pfeiffer & Sealy 2005), stable isotopic research (e.g., Sealy & van der Merwe 1987) and other lines of reasoning.

---

1 We have profited from discussions and correspondence with many colleagues in South Africa and abroad. Graham Avery, Margaret Avery, Simon Hall, John Parkington, Cedric Poggenpoel, Richard Redding, Karim Sadr, Judy Sealy, Andy Smith, Brian Stewart, Deano Stynder, Hans-Peter Uerpmann, Margarethe Uerpmann, Steph Woodborne and Royden Yates in particular have always been available for discussion and been generous in sharing their ideas and data. We thank our colleagues in the geosciences, particularly John Compton, Peter Felix-Henningsen, Markus Fuchs and Dave Roberts. We are particularly indebted to Peter Felix-Henningsen for his work in developing a general stratigraphic system for the Geelbek Dunes. The West Coast National Park, South African Heritage Resources Agency and Heritage Western Cape have been supportive of our research. The Iziko South African Museum has over the course of many years provided equipment, laboratory and storage space. We are grateful to the Iziko staff, especially Graham Avery and Royden Yates, for their generous scientific and logistical assistance. N. J. Conard thanks Judy Sealy and John Parkington for their invitation to teach as a visiting professor in the Department of Archaeology at the University of Cape Town in 2005. The first draft of this paper dates to that period. This work has been funded by the Deutsche Forschungsgemeinschaft (Grant CO-226/5-5). Finally we thank the many students from the Universities of Tübingen and Cape Town who contributed to the fieldwork at Geelbek.

Here we use the data from Geelbek to address this question from a different angle. The work at Geelbek has documented 23 archaeological localities in detail and provides information on finds from an area of over 80,000 m^2. The data obtained from this large surface area allow us to identify new kinds of sites and gain new insights into how near coastal environments were used in recent millennia. Rather than asking whether the inhabitants of Geelbek were hunter-gatherers or herders, with all the assumptions these terms often bring with them, we prefer to consider the specific activities that can be identified in the deflation hollows at Geelbek and use these observations to draw conclusions about the economic practices and settlement dynamics of the people who left diverse classes of material at Geelbek. As we will see, the data from Geelbek blur the boundaries between on and off-site archaeology, providing a different kind of dataset than that available from the shell middens, caves and rich open-air sites that have thus far been the focus of archaeological research in the Western Cape. We hope that this strategy will increasingly allow archaeologists to determine what happened across the entire landscape and help researchers gain a more complete view of past lifeways, based in part on the ephemeral sites and scattered finds within the fynbos biome.

Geographic Setting and Research Design

As early as the 1960s visitors to the Geelbek Dunes of the Western Cape Province of South Africa identified deflated archaeological finds in association with faunal remains. The Geelbek Dunes are situated within the West Coast National Park, 5 km from Sixteen Mile

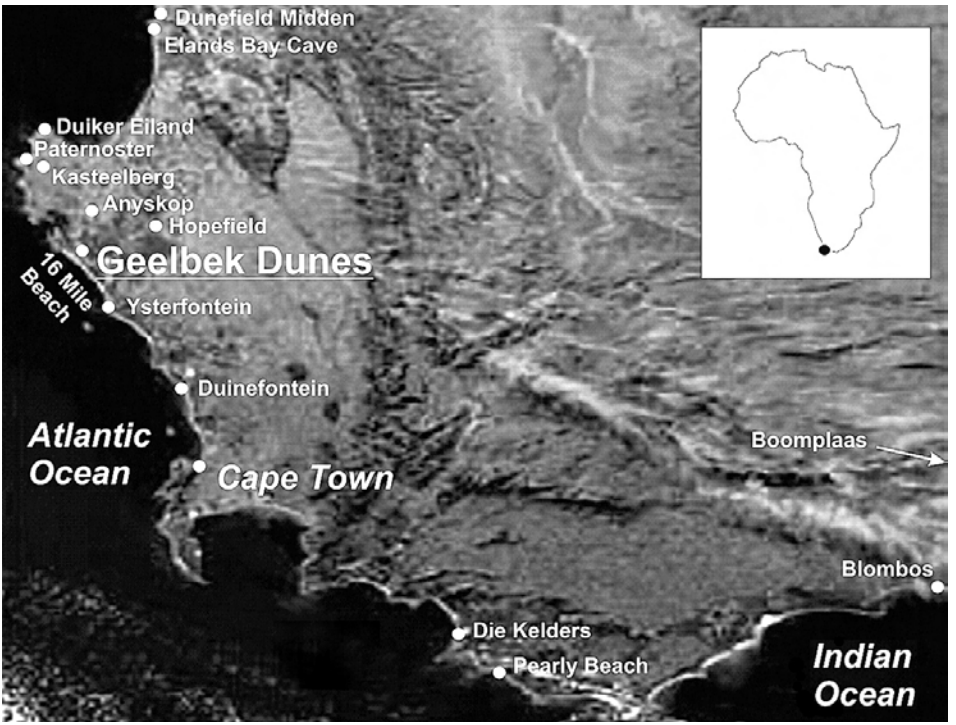

Fig. 1: Map of southwestern Africa showing the location of the Geelbek Dunes and other place names mentioned in the text.

Beach along the open Atlantic Ocean and 2 km from the protected tidal flats of Langebaan Lagoon (Fig. 1). In the late 1990s we initiated the *Geelbek-Anyskop Ausgrabungs- und Survey-Projekt* (GAASP). Over the course of eight field seasons from 1998 through 2005 a team of archaeologists from the University of Tübingen documented 23 open-air, archaeological and paleontological localities among 114 deflation hollows in the Geelbek Dunes (Fig. 2) (Conard et al. 1999; 2004; Conard 2002; Kandel et al. 2003; Dietl 2004; Kandel 2004). These localities include Middle Stone Age (MSA) and Later Stone Age (LSA) sites of varying find density. Although these localities are presently covered by highly mobile sand dunes, during most periods of occupation, the modern set of sand dunes had not yet migrated into this region (Franceschini 2003). Instead, the sandy soil was frequently stabilized by strandveld vegetation of low, scrubby brush, as indicated by calcified rhizoliths (fossilized roots) that are visible in the loosely consolidated, uppermost, geological horizon named Ancient Dune II (ADII) by Felix-Henningsen et al. (2003).

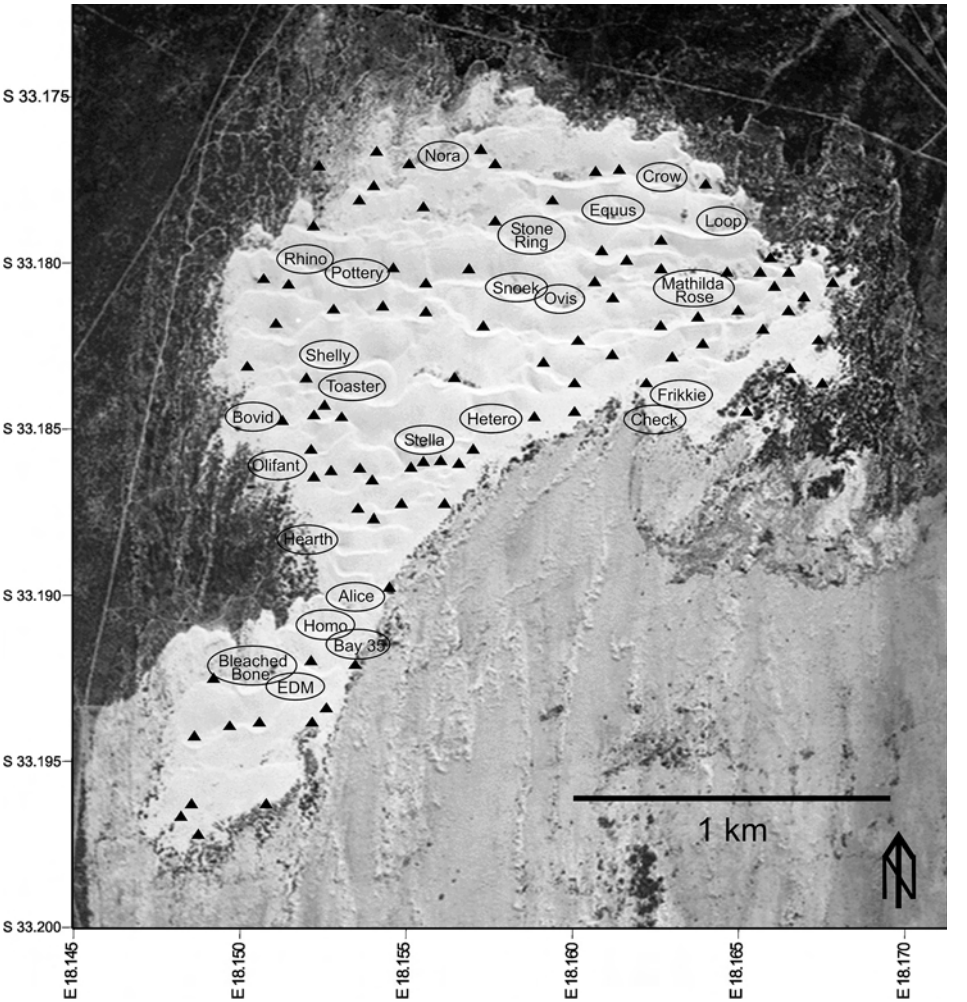

Fig. 2: Geelbek Dunes. Aerial photograph taken in April 2000 showing surveyed localities (triangles) and excavated sites (named, in ovals). The devegetated area in the south resulted from a bushfire in January 2000.

The research strategy at Geelbek takes advantage of the movement of the mobile sand dunes as a means to provide access into the otherwise largely invisible archaeology of the strandveld. Our underlying assumption is that the archaeology inside and outside of the dune field is similar. The key difference is that within the dunes, the migrating sand impedes the growth of vegetation, allowing deflation to occur and thereby exposing archaeological finds from progressively deeper strata. Detailed studies of the deflation hollows at Geelbek document that the dunes migrate northwards at an average rate of 8–10 m per year. Thus, with time researchers can use a migrating deflation hollow as a moving window to study a large portion of the landscape.

The GAASP team has used precision piece-plotting to recover over 30,000 finds. In addition to these surface collections, an area greater than 1600 m^2 has been excavated to gain representative samples of the small finds that escape observation during survey. The work at Geelbek represents one of the first multi-disciplinary studies of large, open-air sites in southern Africa using a computer-based Total Station to piece plot finds. The stored data have been geo-referenced to topographic maps, aerial photographs and satellite images using ArcView 8.2 to provide a fully integrated, referential database that can be expanded in all directions.

The stratigraphy in the Geelbek dune system is not ideal since the finds lie upon exposed, deflated ancient dune (AD) surfaces. Thus, archaeological materials can deflate downwards through the stratigraphic sequence. However, the loss of stratigraphic resolution mainly affects the lower lying calcrete deposits, where MSA and LSA materials can lie side by side. In more favorable geological settings, such as on the less deflated surfaces of ADII and the underlying ADI, materials are often found in association. In certain cases we were able to document the assemblages as they deflated, so that their spatial integrity compares to that of an undisturbed site from an excavated context. Using systematic experiments, we documented and quantified the effects of deflation on materials of varying size, shape and density (Kandel et al. 2003). As one might expect, strong wind more easily displaces flat objects of low density, like shell fragments and small bones. Thus, while deflation may compromise the spatial integrity of the finds, the horizontal association of the objects does not radically change. Denser finds typically migrate vertically and slightly down slope during deflation, regardless of the wind direction. Although lithic and pottery scatters become more diffuse with deflation, refitting and spatial studies show that archaeological associations survive the seemingly destructive effects of deflation (Kandel & Conard 2003).

Here we focus on the assemblages found above ADII (Felix-Henningsen et al. 2003). The deposition of ADII consistently dates between 5-6 ka based on two IRSL dates from the Quaternary Dating Laboratory in Pretoria and two OSL dates from the luminescence dating laboratory in the Department of Geomorphology at the University of Bayreuth (Tab. 1). The key assemblages overlying ADII come from the six localities of Check, Nora, Pottery, Shelly, Snoek and Toaster. For comparison, we also include the locality Rhino as an example of a temporally mixed assemblage. Table 2 presents the results of 20 radiocarbon dates on archaeological materials from these seven localities. The dates document episodes of occupation and use of these sites primarily during the last three millennia, with the main focus of occupation evident between about 700 and 400 cal BC.

The GAASP team collected and piece-plotted the surface finds from 23 of the deflation hollows in multiple episodes between 1998 and 2005. The team plotted all lithic artifacts, ostrich eggshell beads and fragments of pottery, as well as terrestrial and marine faunal remains larger than 2 cm. Excavated sediments were screened through 10 and 1 mm mesh and produced large samples of smaller finds. The surface area of these localities ranges from less than 1000 m^2 up to more than 10,000 m^2, and the area of excavation ranged up to 293 m^2. Table 3 presents an overview of the materials recovered from the six later Holocene localities, as well as Rhino.

In the present context it is important to carefully define spatial and geographic terms. We refer to the immediate coastal zone corresponding to the 200 m wide strip of land along the shoreline. The coastal zone includes the coastline and littoral dunes. Substantial shell middens are commonly found in this zone, where the transport costs of marine resources are minimal. The archaeological localities at Geelbek are not in the immediate coastal zone, but rather, within the near coastal environment. We use the term near coastal strandveld or more generally, near coastal environment, to refer to this region. As depicted in Acocks (1988), the West Coast strandveld can extend as much as 30 km inland. A more recent assessment of this vegetation zone by Low & Rebelo (1996) uses the term »dune thicket« instead of strandveld. When we refer to the near coastal strandveld, we are referring to the area between the inland side of the littoral dunes and 10 km inland. Our definition of the spatial extent of the near coastal environment is meant only as a rough guideline, and does not imply that a significant ecological divide exists 10 km inland.

Within the near coastal environment, we expect to see considerable local and regional variation in the archaeological record. The work at Geelbek builds on earlier research by Manhire et al. (1984) in deflation hollows near Elands Bay. Research at Geelbek reflects the first systematic attempt to document the low density archaeological signature of the near coastal environment as a means of developing models for the prehistoric use of this zone. Prior to the late 1990s the technology did not exist for precise, high speed piece-plotting of large areas as undertaken at Geelbek.

The appraisal of the landscape as immediate coast, near coastal environment and inland area reflects our interest in linking geomorphological and vegetational criteria with human economic behavior. A validation of such an approach is suggested by the trend toward decreasing amounts of marine resources with increasing distance from the coast. While the signal is noisy, there is an exponential decline in the abundance of archaeologically visible coastal resources as one moves inland. However, this assumption must be used with caution. The large, coastal shell middens may have served primarily as food processing centers to produce lightweight, stored foods that could be easily transported inland for consumption at a later time (Parkington 1976). Some sites in near coastal and even inland settings further than 10 km from the Atlantic Ocean preserve abundant evidence for the use of marine resources. At Kasteelberg A and B, located 5 km from the coast, seal is the dominant component of the faunal assemblages (Klein & Cruz-Uribe 1989).

Terrestrial Resources

The terrestrial fauna from Geelbek represents the largest assemblage of material in the GAASP collection, with over 13,000 piece-plotted finds from all localities. Yet in some respects, it is the most difficult to interpret. While it is clear that people are the primary agents who brought stone artifacts, pottery and marine resources to Geelbek, we often cannot prove which agent led to the accumulation of terrestrial fauna. Occasional impact fractures or cutmarks demonstrate a direct link between people and the fauna, but more often than not, the causal association is difficult to demonstrate. Burning is well-documented among the faunal assemblages and regularly associated with calcrete features, but some degree of burning might also result from natural bushfires (Avery et al. 2004). Work is currently underway to demonstrate or refute the association between terrestrial faunal elements and human behavior.

Here we take the data from the terrestrial fauna (Tabs. 4 and 5) at face value. In terms of bone counts, the carapaces of the angulate tortoise (*Chersina angulata*) dominate most of the assemblages. The second most abundant faunal remains come from small bovids (size class 1) including steenbok (*Raphicerus campestris*). Cape hare (*Lepus capensis*) and the

Cape dune mole rat (*Bathyergus suillis*) are next most represented. Taken together, these small animals dominate all of the Holocene faunal assemblages. Larger fauna include eland (*Taurotragus oryx*), black rhino (*Diceros bicornis*) and elephant (*Loxodonta africana*). When present, the larger species dominate in terms of their weight percent but are poorly represented at the localities on ADII. The remains of an eland bearing cutmarks and impact fractures at the locality of Snoek and the remains of an elephant with evidence of burning at Toaster are two exceptions to the general pattern reflected in the assemblages dating to the last 5000 years.

Thus, mainly small terrestrial animals, and occasionally large mammals, contributed to the diet of the occupants of the younger LSA localities at Geelbek. Based on the populations of large, medium and small game now living in the West Coast National Park coupled with early reports by Europeans from the West Coast (Skead 1980), there is every reason to assume that the Geelbek strandveld supported substantial populations of game in prehistoric times. This fauna would have played an important role in the subsistence practices of the people using the near coastal environments. The presence of hunting gear including numerous backed points and several bone linkshafts in the LSA assemblages is consistent with this interpretation.

One of the most enigmatic aspects of the faunal record of the Western Cape is the paucity of evidence for sheep. Other than Kasteelberg (Klein & Cruz-Uribe 1989; Sadr et al. 2003) where some excavated units contain high numbers, most sites include low numbers of sheep bones. Some cave sites, including Boomplaas (Deacon et al. 1978), Die Kelders (Schweitzer 1979) and Blombos (Henshilwood 1996) have produced small assemblages of sheep dating to after 2000 BP. Open-air sites including Dunefield Midden, dating between 1300 and 1400 cal AD, have also yielded small assemblages of sheep (Parkington et al. 1992). However, other than at Kasteelberg, sheep played only a minor role as a source of meat.

Smith (2005) has consistently argued that sheep are most valuable on the hoof as milk producers and would rarely be slaughtered. This view echoes that of Gordon Childe (1936) and other archaeologists who for years have stressed that pastoralists are archaeologically invisible. Outside villages, where domesticates dominate many Near Eastern faunal assemblages and burial sites (Uerpmann et al. 2000), sites documenting mobile pastoralists are essentially unknown, despite concerted efforts to find evidence of this economic form (Richard Redding, pers. comm.). This being the case, the general lack of sheep bones at the localities of Geelbek and other sites in the Western Cape should not be taken to assume uncritically that herders were absent from the region. Nor should this near invisibility of herders be taken as proof that hunter-gatherers dominated the landscape. For the time being, we remain poorly equipped to define the relative strengths of hunter-gatherer and herding populations. Smith (1998; 2005) stresses that the ideological basis of herding and the importance of delayed return strategies would conflict with the economic strategies of immediate return employed by hunter-gatherers. Thus, while social relations probably existed between herders and hunter-gatherers, we should not expect the fully fluid movement between these subsistence strategies as Sadr (2004) suggests.

Due to the poor chances for preservation in an open-air setting, we have no direct evidence for the use of botanical resources at Geelbek. However, the presence of adzes and scrapers, discussed below, suggests that plant materials were worked on these sites. Based on archaeological data from cave sites, there is good reason to assume that plant materials including grasses and reeds for bedding, corms, seeds and fruit for dietary needs and wood for cooking played an important role in the daily activities of the people who inhabited the near coastal environment (e.g., Liengme 1987; Binneman 2000).

Marine Resources

While less dominant than the terrestrial resources, marine resources at Geelbek include over 3000 piece-plotted finds, 80 % of which is concentrated in the localities found above ADII. Of the marine resources, mollusks account for the largest category of finds by far. The occupants of Geelbek carried shells of black mussel (*Choromytilus meridionalis*), white mussel (*Donax serra*) and, to a lesser degree, limpets (mostly *Cymbula* spp. and *Scutellastra* spp.) into the near coastal strandveld for consumption (Tab. 6).

Since the shoreline has not moved significantly during recent millennia, a configuration similar to today's can be assumed for the sandy coastline along Sixteen Mile Beach (Compton & Franceschini 2005). Given the scarcity of rocky substrate within the intertidal zone, the black mussels and limpets likely originate from further away. Potential collecting areas exist to the north, on the Postberg Peninsula, or to the south, near Ysterfontein. In either case, the shells of these rocky dwelling species would have been carried at least 15 km before being consumed and discarded at Geelbek. Despite their frequency, the dietary value of the black mussels made only a modest contribution to diet based on Buchanan's (1988) data. White mussels, which favor a sandy coast, were collected at a minimum of 5 km away. These robust shells provided an attractive raw material for manufacturing scrapers, and it may be this specialized use that outweighs their dietary contribution. About 18 % of the white mussels show evidence of retouch, with a maximum of 66 shell scrapers documented at Shelly (Tab. 6).

This being said, we emphasize that the ephemeral shellfish accumulations in the near coastal strandveld at Geelbek contain a fractional amount when compared to middens on the coast. Significant accumulations of shell abound in the archaeological literature of the Western Cape (e.g., Klein 1972; Schweitzer 1979; Parkington et al. 1992). For example, the 859 m^2 excavated at Dunefield Midden near Elands Bay produced over two metric tons of shellfish remains (Tonner 2005). In contrast, the richest locality at Geelbek, Shelly, yielded 4.6 kg of shell from 4750 m^2, followed by Nora with 1.3 kg and Pottery with 0.5 kg. We would expect the volume of shell to diminish inland in the near-coastal strandveld (e.g., Jerardino & Yates 1996) since the processing of shellfish occurred mainly near the shoreline (Parkington 1976)

Compared to the mollusks, crustaceans from Geelbek play a minor role. Two mandibles of the rock lobster (*Jasus lalandii*) have been recovered from Pottery and one from Shelly. Their contribution to the LSA diet at Geelbek was no doubt small, but like the black mussels and limpets, they would have been collected along rocky shorelines about 15 km away. At many of the West Coast sites including Paternoster, Dunefield Midden and Elands Bay Cave, the frequency of lobster is significantly greater (Robertshaw 1977; Parkington et al. 1992; Jerardino & Navaro 2002).

The only marine vertebrates documented at Geelbek are two finds of Cape fur seal (*Arctocephalus pusillus*) from separate localities and four finds of African penguin (*Spheniscus demersus*) from three localities (Tab. 5). Similar to shellfish and rock lobster, these sparse finds suggest the occasional transport of seal and penguin into the strandveld. Again the context of this behavior is different than at more intensively used sites like Dunefield Midden or Kasteelberg, where seals are the most represented species of the faunal assemblages. As we suggest for the shellfish, seal was not systematically acquired and then processed at Geelbek. The limiting variable, however, is not the distance from the open coast, since sites like Kasteelberg contain abundant seal bones despite being located as far from the coast as Geelbek.

Further information about the use of marine resources comes from the localities of Pottery and Nora where whale barnacles (*Coronula diadema*) provide evidence for the transport of whale meat and blubber inland (Kandel & Conard 2003). Whales stranded on

Sixteen Mile Beach were occasionally available to the inhabitants of Geelbek, who carried packages of skin, blubber and meat at least 5 km inland for processing and rendering. At Pottery the context of the barnacles around a burned calcrete hearth documents the importance of this resource as early as 1100 cal BC (Tab. 2).

Small numbers of fish vertebrae are present at most Geelbek localities. The collections include scattered remains of sea white catfish (*Galeichtys feliceps*), white steenbras (*Lithognathus lithognathus*) and white stumpnose (*Rhabdosargus globiceps*) (Cedric Poggenpoel, pers. comm.). While it is likely that humans used fish as a resource, we remain cautious about such pronouncements based on this evidence. For now, we are unable to rule out the possibility that sea birds were responsible for regurgitating the bones in the near coastal strandveld (Graham Avery, pers. comm.).

The archaeological signal for the use of all marine resources points to high mobility and a diverse pattern of use. Nowhere at Geelbek is large-scale processing of marine resources documented. On the contrary, the use of marine resources at Geelbek points to a high degree of flexibility and mobility.

Lithic Artifacts

The 23 localities contain over 8900 lithic artifacts, most of which date to the LSA. At some localities a clear MSA component also exists (Conard et al. 2004; Dietl 2004; Dietl et al. 2005). The lithic artifacts are found in varying densities on the surface or immediate subsurface of the deflation hollows. This pattern of distribution allowed the GAASP team to piece-plot all of the visible lithic artifacts while surveying the deflated surfaces. Subsequent excavation and screening of the sediments led to a significant increase in the recovery of smaller lithic artifacts.

Given that the intensity of excavation varied greatly among the localities, the most representative way to compare lithic densities at Geelbek is to consider the density of finds per unit area surveyed. It is important to reiterate that collections extend over the entire area studied and include what would traditionally be referred to as both on and off-site. The large size of the areas surveyed explains the very low density values that range from 0.03 artifacts/m^2 at Check to 0.44 artifacts/m^2 at Shelly (Tab. 3). The shallow depth of the archaeological deposits and the complexity of estimating the amount of deflated sand make it impossible to calculate a density per unit sediment volume (artifacts/m^3) as is often done in the Western Cape (e.g., Jerardino 1995). Thus, it remains to be demonstrated whether these figures provide meaningful comparative values for the intensity of occupation in the near coastal strandveld beyond the Geelbek Dunes.

The lithic artifacts from the MSA of Geelbek have been described elsewhere (Dietl 2004; Dietl et al. 2005), and the LSA artifacts have been reported in tabular form with illustrations (Conard et al. 1999; Conard 2002; Kandel et al. 2003). While the lithic assemblages from the surface of ADII are still under study, we will consider some of the key observations made thus far.

The radiocarbon dates (Tab. 2) indicate a period of more intense occupation during the middle of the first millennium cal BC in this part of the near coastal environment. The finds from Nora, Pottery and Shelly fall into the period corresponding to Buchanan's (1988) »megamidden« period in the coastal Western Cape. The locality Toaster yielded a date in the earliest first millennium cal AD. The localities Check and Toaster both produced dates in the latter part of the first millennium cal AD, while a human bone from the locality Homo also falls into this period. Radiocarbon dates from the second millennium cal AD come from the localities Crow, Hetero and Snoek. The calibrated ages include a correction factor for either ostrich eggshell (Vogel et al. 2001) or the reservoir effect in marine shell.

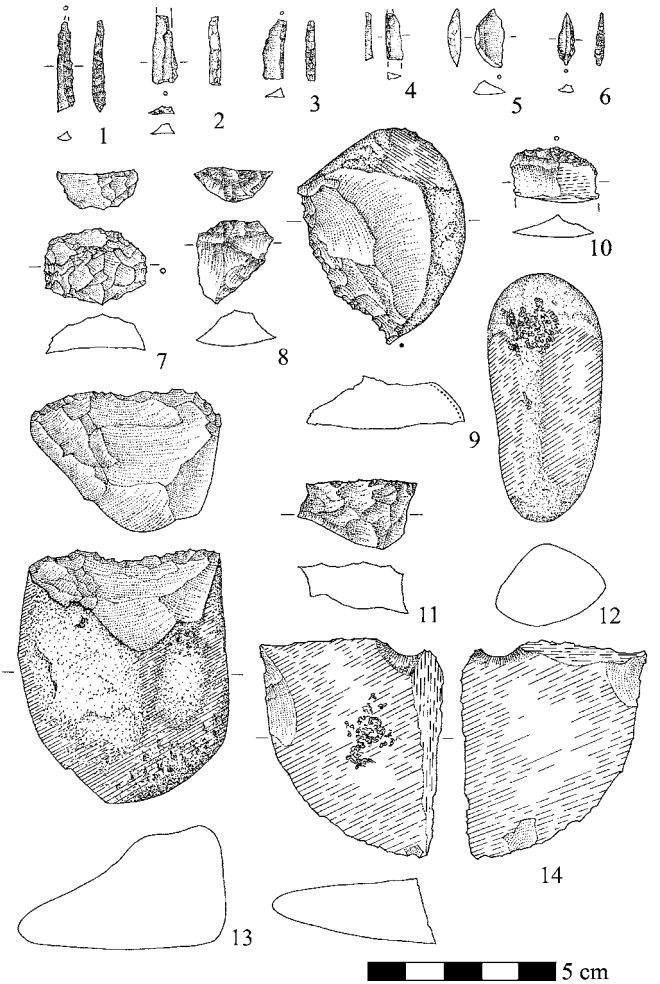

Fig. 3: Geelbek Dunes. Lithic artifacts from several localities.
1 backed point (B35-701);
2–4 backed bladelet (CH-395.1, SN-1304, SN-212);
5 segment (SN-187);
6 backed point with tanged base (PO-2443);
7–8 adze (NO-1401, SH-1523);
9 side scraper (SH-194);
10 end scraper (PO-2261);
11 platform core (SH-1570);
12 hammerstone (PO-3293);
13 platform core on hammerstone (SH-877);
14 fragment of bored stone (EQ-1072).
Drawings by S. Feine.

Selected lithic artifacts are illustrated in Figure 3, and a summary of the analytical data is presented in Table 7. While a detailed discussion of the context and composition of each assemblage is beyond the scope of this paper, some basic conclusions about the lithic assemblages can be drawn. First, artifacts from approximately contemporaneous accumulations show considerable variation. For our current purposes, we exclude finds smaller than 10 mm in order to avoid swamping the signal with the abundant small debitage (5–10 mm) and microdebitage (<5 mm). If we consider the formal tools from Nora, Pottery and Shelly, the results are relatively consistent (Tab. 7). Formal tools comprise 7 % (n=15 of 208), 3 % (n=4 of 142) and 6 % (n=21 of 373) of the respective totals. At other localities like Snoek the ratio of formal tools reaches a considerably higher value of 15 % (n=33 of 221). Within the assemblages of formal tools (Tab. 8), the higher the ratio of backed pieces (backed points, segments and backed bladelets), the greater the trend toward a hunting tool kit. This index ranges from 0 % (n=0 of 4) at Pottery up to 85 % at Snoek (n=28 of 33). The other localities display intermediate values from 24 % to 35 %. If we consider the ratio of adzes and scrapers as a percentage of formal tools, we can create a functional index that

relates to the preparation of botanical resources and hides (Tab. 8). The scraper and adze index shows an inverse effect as compared to the backed ratio, and ranges from 6% (n=2 of 33) at Snoek up to 75% at Pottery (n=3 of 4). Despite the limited sample sizes, these data provide insight into the specific types of activities that occurred at these localities.

Independent of a detailed assessment of the cultural chronology of the region and ignoring the issues related to the possible presence of mixed assemblages, the lithic assemblages at Geelbek are clearly variable. This variation demonstrates that prehistoric people used the near coastal environments for a wide variety of purposes after the deposition of ADII some 5000 years ago.

The study of the abundance of lithic raw materials and reduction sequences also provides economic information about the use of near coastal environments. Here we utilize the data from all size classes of lithic artifacts. The abundance of the lithic raw materials represented among the chipped stone finds is summarized in Table 9. With the exception of Snoek, quartz dominates all of the assemblages. Only at Snoek does silcrete predominate. Other raw materials including quartzite, crypto-crystalline silicate (CCS), silcrete and granitic rocks are present in descending order of representation. Although these materials are not readily available in the open strandveld, the majority originate locally (Floss 1994) within 20 km of Geelbek. The presence of high proportions of cortical debitage and cores at Nora, Pottery and Shelly indicates that primary knapping took place at these localities. On the other end of the spectrum, localities like Snoek are characterized by the lowest abundance of cortical debris and the highest proportion of retouched forms. In other cases, including the localities Alice, Bleached Bone, Check and Loop, the presence of single backed points suggests a failed hunt, an animal that got away (Yellen & Lee 1976). Thus, the research strategy of documenting areas with extremely low artifact densities helps reconstruct sites and completes our limited view of landuse that was based mainly on the study of high density cave and midden sites.

Pottery

Eight localities at Geelbek have produced prehistoric, sand-tempered pottery dating from the last 2000 years. The quantities vary from a few isolated sherds, presumably from single pots at Loop, Check, Crow and Equus, to over 400 pieces from at least three pots at Toaster. Most of the pots are highly fragmentary, but refitting has thus far produced relatively complete vessels from Stone Ring and Pottery. The pot from Stone Ring is a small, spouted vessel, 167 mm in maximum diameter, with a pointed base and bosses on its neck (Fig. 4). Amongst the ceramics from Pottery there is a large, undecorated mid-section of about 300 mm diameter with carbonized residues on its interior.

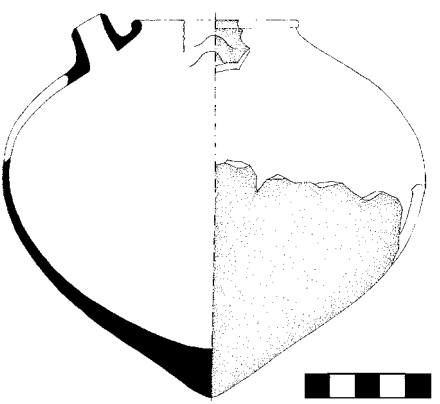

Fig. 4: Geelbek Dunes. Spouted, pointed-base, ceramic vessel from Stone Ring. Drawing by S. Feine.

The concentration of ceramics at Stone Ring is associated with a bored stone, and the vessel fits within the seriation from Kasteelberg A and B, units 12–16 (Sadr & Smith 1991). Rudner (1968, 495 fig. X.6) describes similar vessels from Ysterfontein in the Western Cape and other regions of southern Africa. Radiocarbon dates for

Kasteelberg B units 12-16 fall between 1300 and 800 BP and are associated with large numbers of seal and sheep bones (Sadr & Smith 1991). This has led Smith to argue for a strong link between the presence of pottery and herders. However, Sadr (2004) has more recently suggested that pottery may have entered the Western Cape independently of the migration of herders into the region.

Studies on organic residues indicate that ceramic vessels were often used to cook, render or store various animal products (e.g., Patrick et al. 1985; Copley et al. 2004). By comparing experimental results to the observed residues patterns on pottery from Dunefield Midden, Stewart (2005) demonstrated how vessels with pointed bases were likely propped up in loose sand for cooking. New results on spouted vessels from Kasteelberg D confirm the cooking of marine-derived fats (Copley et al. 2004). Such spouted vessels are similar to that described from Stone Ring. Initial results from the residue analysis on the plain ceramics from the locality Pottery conducted by the University of Bristol's Organic Geochemistry Unit document the presence of lipids that provide suggestive, but not conclusive, evidence that the vessels contained marine lipids, as well as other fats (Mark Copley, pers. comm.). These data suggest that pots at Geelbek were used in connection with marine resources and presumably in other contexts as well.

As discussed above, the locality Pottery yielded evidence for the rendering of whale blubber, but the associated dates fall clearly in the pre-pottery period. Thus, the ceramics at Pottery cannot be temporally associated with the majority of cultural remains that date to the first millennium cal BC. While the means used to render whale oil have yet to be conclusively demonstrated, historical data point to its use and storage. For example, van Riebeeck's diary from 1654 (Thom 1952) documents the storage of oil in sea bamboo kelp (*Ecklonia maxima*). An informal test on three kelp stalks found on Sixteen Mile Beach showed that each bulb could hold about one liter of fluid. Other containers may have included ostrich eggshells and animal skins (e.g., Budack 1977).

Features

The most notable archaeological features at Geelbek are 49 circular to oval-shaped concentrations of calcrete found on ADII (Tab. 10). This total should be viewed as an estimate, given that the features tend to merge with their neighbors when spaced closely together. Only two of these features are composed exclusively of natural-colored, beige calcrete blocks averaging 12 cm in size and ranging up to 50 cm. Most are comprised of darker, gray to black calcrete blocks averaging 6 cm in size and ranging up to 30 cm. More than 85 % of the measured calcrete blocks were darker than the natural beige color. The undeflated features typically have diameters of 2–3 m, but after deflation, the distribution of calcrete is usually in the range of 3–5 m. There is no indication that these features predate the formation of ADII 5000 years ago.

The frequency of the features varies within each locality. For example, both Toaster and Shelly include no fewer than ten features each, while six localities contain only one. The distribution of these features covers all parts of the Geelbek Dunes. They are more abundant in the north and west, with the western deflation hollows containing the highest numbers. The unsurveyed locality named Hearth beyond the western edge of the dune field includes eight calcrete features on ADII.

Stone features are among the most visible archaeological features from many coastal sites of the Western Cape (Avery 1974; Robertshaw 1979; Kandel & Conard 2003; Hine 2004; Sealy et al. 2004). At Pearly Beach on the south-western coast, Avery (1974) identified four types including: (1) stone hearths with ashy matrix; (2) stone hearths without ashy matrix; (3) burial coverings; and (4) possible base anchorages of huts or windbreaks.

Until now, most of the dates associated with hearths stem from the last two millennia, with one exception: charcoal from a stone hearth at Duiker Eiland on the West Coast dated to 2280 ± 45 BP (Robertshaw 1979). In addition to the archaeological remains, reports about stone hearths come from historical documents such as the diary of G. Meister from 1688 (Raven-Hart 1971, 347). While not all of the features show clear signs of burning, the majority do, and the terms that have been applied to them, including stone hearth and roasting platform, appear appropriate.

At Geelbek the material used to construct these features was locally available calcrete. Since most of the features are found atop ADII, natural modes of transport can be ruled out. In cases of extreme deflation, the features rest directly on calcrete. Nonetheless, the features themselves remain intact and visible. The darker pieces are on average smaller, and thus more fragmented, than the beige pieces, which supports the hypothesis of burning. Our observations after an intense bushfire in 2000 (Fig. 2) indicate that the degree to which calcrete pieces from these features are burnt was not achieved. Nor was experimental burning in a fireplace successful in replicating the dark color of the calcrete. Further research in this area is needed, but we propose that burning in a reducing environment or in the presence of fat could produce the observed coloration.

The best functional data from the stone hearths at Geelbek comes from the locality Pottery where about 20 % of fauna and marine shell around the periphery of Feature 1 are burned. Amongst the finds are 35 pieces of whale barnacle, one of which dates to 1090 ± 60 cal BC (Tab. 2). We view this as strong evidence that this stone hearth was used for cooking whale meat and rendering blubber as early as 3000 years ago.

Stone hearths may well have been useful for controlling and storing the heat produced by fires for cooking or roasting large animals or large volumes of other food. Those that lack signs of burning may have been under construction or served purposes other than food preparation. For example, these concentrations of calcrete could have stabilized the otherwise soft, sandy substrate to create firm working surfaces, seats or, as suggested by Avery (1974), bases for windbreaks or living structures.

While stone hearths are most commonly associated with coastal and near coastal environments, two stone hearths are preserved at the Anyskop Blowout in the West Coast Fossil Park at Langebaanweg (Conard 2002). This hilltop locality lies 20 km from the open coastline. There are few indications that marine resources were used at Anyskop, and the remains of large mammals are scarce. These observations warn against assuming that all stone hearths served the same function. Many more dates for these features and additional contextual information are essential for establishing their function and role in the system of settlement and subsistence practiced in the Western Cape. Additional information on their presence in more inland settings would also help to test the hypothesis that they are mainly associated with near shore regions. Other than Anyskop and Boomplaas Cave (Deacon et al. 1978) we are not aware of their existence in other inland settings.

Ornaments and Bone Tools

Several types of ornaments and bone tools are present in the deflation hollows at Geelbek. Most notably, the localities on ADII have yielded 1047 ostrich eggshell (OES) beads in various stages of production (Tab. 11). The localities of Nora and Shelly document an emphasis on producing unburned OES beads, while the assemblage from Pottery is characterized mainly by burned, finished beads. Following Jacobson's (1987) line of argument, sites where beads are produced were more likely occupied by woman and children for longer periods than sites that do not document the production of beads. These results need to be

viewed in a broader context, but taken at face value, the production of OES beads could be considered as an indicator of complex social units including families at Nora, Shelly and probably Pottery (Kandel & Conard 2005).

Other examples of ornaments have been recovered at Geelbek, such as the complete, unperforated, nacreous, oval ornament from Toaster, measuring 37 mm by 64 mm, made from perlemoen (*Haliotis midae*). Another worked piece of perlemoen from Stella may represent a blank for a similar type of ornament. Found among the sherds of the spouted vessel from Stone Ring is a single cowry shell (*Cypraea* sp.), a mollusk that is often associated with personal adornment. In these cases, we do not yet have reliable dates for the finds.

Bone tools are represented by an engraved linkshaft with cross-hatches from Homo, six undecorated ones from Crow and one from Shelly. From Toaster comes a tool consisting of a worked rib bone, pointed at both ends, 112 mm long, 10 mm wide and 3.6 mm thick. To our knowledge this tool type has not been described in the archaeological literature, and we are not sure what use it served.

Human bones

Among the more than 13,000 piece-plotted bones from Geelbek, 23 finds of human remains have been recovered. Despite their scarcity, these bones provide important insight into the lifeways of the later LSA occupants of the near coastal strandveld. Colleagues at Groningen ran accelerator dates on three human bones, and Judith Sealy of the University of Cape Town's Archaeometry Laboratory measured stable carbon and nitrogen values (Tab. 12). The oldest skeletal remains from the locality Loop date to 50 ± 50 cal BC. The isotopic measurements from this individual produced one of the highest $\delta^{15}N$ values known from the Western Cape and indicate an unusually high consumption of marine foods. This male of 157 ± 3.6 cm stature (Alan Morris, pers. comm.) was not a herder who subsisted on products stemming from domesticated sheep. The other individuals are from the localities Homo and Hetero and date to 920 ± 60 cal AD and 1510 ± 80 cal AD respectively. Their isotopic signals fall within the typical range of values from the Western Cape during the last two millennia and most likely indicate a mixed diet of marine and terrestrial resources. They too were not subsisting entirely on domesticated sheep or other terrestrial resources. These results are consistent with other data from human skeletal remains that point to mixed economic forms (Pfeiffer & Sealy 2005).

Conclusions

The overall archaeological signal from Geelbek points to a non-specialized economy in which small numbers of people practicing a settlement system with high mobility sporadically used the strandveld for diverse activities. These data come from large-scale, systematic, surface collection and excavations in low density accumulations in the veld, several kilometers from the Atlantic Ocean near Langebaan Lagoon. This type of archaeological setting has been largely overlooked by earlier research that instead focused on higher density caves, rockshelters and shell middens. The geological setting at Geelbek provides a chronological framework for studying these low density sites. The results from Geelbek grow in meaning when we consider that this sample of sites provides a behavioral signal that can be extrapolated into a much larger area of the strandveld of the Western Cape. If we are correct, future study of this geomorphological zone will provide similar evidence for high mobility, low intensity landuse in the largely undifferentiated strandveld. Particularly in areas such as springs or water holes would we expect to find evidence for

more frequent and intensive use of this zone. Future modeling of subsistence and settlement can apply the data from Geelbek to approximate the way people used this part of the landscape during recent millennia. Similar analyses based primarily on the MSA lithic assemblages at Geelbek and Anyskop (Dietl 2004; Dietl et al. 2005) and Acheulean lithic artifacts at Anyskop (Conard 2003) indicate that this research strategy also provides valuable data from much earlier periods.

The results indicate that even low intensity use of the landscape and highly mobile settlement patterns can leave a recognizable archaeological signature. The data help reconstruct past systems of behavior and constrain models for prehistoric economies of the Western Cape. As more data from brief occupations like those at Geelbek become available, we will increasingly be able to link prehistoric people to the landscape in which they lived. In doing so, we will be able to fill in large gaps in the archaeological record of the far richer sites that have traditionally been the focus of excavations and analyses. This work will help us to identify places where brief stops and encampments occurred, where hunting took place based on the loss of hunting equipment, and even where animals got away during Stone Age hunts. Most of these low visibility activities provide important lines of evidence for reconstructing how people lived in the past. Other than the presence of a few pots and a few large ostrich eggshell beads, we see no indications that Geelbek was home to people that practiced herding. In the context of this paper we begin to see the elusive movements of the hunter-gatherers who persisted in the near coastal environments long after the arrival of new ideologies and economic forms brought by herders and pastoralists to the Western Cape (Parkington 1984; Smith 1998).

Tables 1 to 12

Locality	Index	Lab ID	Method	Material	Geological Unit	Depth (cm)	Date ka	+/-
SNOEK	1646	MGF5-BT7	OSL	sand	ADII (reworked)	30	1	0.1
ALICE	553	MGF3-BT11	OSL	sand	ADII	150	5	0.5
ALICE	552	MGF3-BT10	OSL	sand	ADII	50	5	0.5
STELLA	1910	GB-SC-1	IRSL	sand	ADII	80	5	1.0
POTTERY	3713	GB-PO-3713	IRSL	sand	ADII	60	6	1.0
RHINO	1776	GB-RH-1776	IRSL	sand	ADI	150	10	1.0
ALICE	554	MGF3-BT12	OSL	sand	ADI	170	10	1.0
STELLA	1911	GB-SB-1	IRSL	sand	ADI	15	11	1.0

Tab. 1: Geelbek Dunes.
Results of luminescence dating of the Ancient Dune (AD) horizons.

Locality	Index	Bulk sample	Lab ID	Method	Material	Modified	Detail	uncal BP	+/-	cal	cal +/-
SNOEK	1327	-	KIA-17758	AMS	OES	yes	Large bead	380	20	AD 1700	160
SNOEK	1600	-	Pta-8768	14C	bone	-	Eland humerus	410	45	AD 1510	80
SNOEK	1525	-	Pta-8406	14C	bone	-	Eland thoracic vertebra	460	45	AD 1460	50
SNOEK	500	-	KIA-17759	AMS	OES	yes	Perforated OES	775	40	AD 1350	90
SNOEK	493	yes	KIA-17762	AMS	OES	yes	Perforated OES	890	20	AD 1260	100
TOASTER	1548	-	KIA-17760	AMS	OES	yes	Large bead	1260	25	AD 940	140
CHECK	1214	yes	Pta-8707	14C	shell	-	Black mussel	1730	45	AD 710	70
TOASTER	2627	-	KIA-17749	AMS	shell	yes	White mussel scraper	2385	25	1 BC	70
SHELLY	2935.11	-	KIA-17757	AMS	OES	yes	Small bead	2465	25	390 BC	190
POTTERY	1006	-	KIA-17761	AMS	OES	yes	Small bead	2500	25	450 BC	210
NORA	1321.8	-	KIA-17755	AMS	OES	yes	Small bead preform	2580	25	540 BC	170
POTTERY	3730	-	KIA-17751	AMS	shell	yes	White mussel scraper	2715	25	370 BC	120
SHELLY	2514	yes	Pta-8689	14C	shell	-	Black mussel	2870	20	600 BC	130
POTTERY	3050	-	GrA-28388	AMS	shell	-	Whale barnacle	2900	35	1090 BC	60
SHELLY	3406	-	Pta-8688	14C	shell	-	Granite limpet	2905	20	620 BC	120
POTTERY	527	yes	Pta-8691	14C	shell	-	Black mussel	2950	60	650 BC	130
SHELLY	1251	-	KIA-17748	AMS	shell	yes	White mussel scraper	2960	30	670 BC	120
NORA	951	-	KIA-17750	AMS	shell	yes	White mussel scraper	2970	25	680 BC	120
NORA	1223	yes	Pta-8695	14C	shell	-	Black mussel	2980	20	690 BC	110
RHINO	2419	-	Pta-8770	14C	bone	-	Eland metacarpus	6800	140	5710 BC	130

Tab. 2: Geelbek Dunes.
Radiocarbon dates on marine shell, ostrich eggshell (OES) and faunal remains.

Summary	CHECK*	NORA	POTTERY	RHINO	SHELLY	SNOEK*	TOASTER	TOTAL
Total Area (m^2)	4851	2256	10722	3803	4750	3758	2900	33040
Excavated Area (m^2)	122	214	293	210	214	98	0	1151
Lithic Density (Total m^2)	0.03	0.40	0.06	0.29	0.44	0.07	0.08	0.16
Lithic Density (Excavated m^2)	1.21	4.19	2.22	5.28	9.79	2.76	na	4.70
Material Code								
Fauna**	572	208	1233	987	1095	939	893	5927
Lithics	148	897	650	1108	2095	270	241	5409
Modern	5	10	6	1	5	1	24	52
OES (ostrich eggshell)**	158	25	137	62	115	182	32	711
OES Beads	0	187	614	0	220	1	13	1035
Pottery	3	38	76	0	0	0	409	526
Shells**	405	300	410	75	1089	44	174	2497
Total	1291	1665	3126	2233	4619	1437	1786	16157

Tab. 3: Geelbek Dunes.
Summary of field data. Key: *Preliminary data; **includes the total number of piece-plotted finds plus bulk samples; na not applicable.

	Locality	CHECK*		NORA		POTTERY		RHINO		SHELLY		SNOEK**		TOASTER**		TOTAL	
	Primary geological unit	ADII		ADII		ADII		*all****		ADII		ADII		ADII			
Group Code	Predominant species	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Amphibian	Frog indet.							1	0.1					1	0.1	2	0.04
Reptile	*Chersina angulata*	118	34	110	53	226	22	279	29	697	64	313	38	300	34	2043	38
Fish	*Galeichthys feliceps*			1	0.5	11	1	1	0.1	4	0.4	1	0.1	10	1	28	1
Bird	*Francolinus capensis*	19	5	12	6	43	4	7	1	13	1	53	6	80	9	227	4
Rodent	*Bathyergus suillus*	10	3	15	7	25	2	46	5	33	3	69	8	55	6	253	5
Hare	*Lepus capensis*			17	8	58	6	14	1	18	2	9	1	11	1	127	2
Fauna-1	*Raphicerus* spp.	46	13	43	21	590	56	265	27	292	27	135	16	251	28	1622	30
Carnivore	*Mellivora capensis*			1	0.5	6	1	73	8	9	1			12	1	101	2
Fauna-2	Small medium bovid	13	4	3	1	15	1	25	3	4	0.4	13	2	24	3	97	2
Fauna-3	Large medium bovid	135	39	4	2	33	3	53	5	6	1	61	7	23	3	315	6
Fauna-4	*Taurotragus oryx*	5	1	2	1	38	4	102	11	13	1	176	21	41	5	377	7
Fauna-5	*Diceros bicornis*							79	8					21	2	100	2
Fauna-6	*Loxodonta africana*							21	2	3	0.3			57	6	81	2
TOTAL		**346**	100	**208**	100	**1045**	100	**966**	100	**1092**	100	**830**	100	**886**	100	**5373**	100
Bulk faunal samples		14		0		188		21		3		109		7		**342**	
ALL FAUNA		**360**		**208**		**1233**		**987**		**1095**		**939**		**893**		**5715**	

Tab. 4: Geelbek Dunes.
Summary data for faunal analytical groups. Key: *Data exclude 212 unanalyzed finds; **preliminary data; ***includes ADII, ADI and calcrete.

Species Code	Common Name	NORA	POTTERY	RHINO	SHELLY	SNOEK*	TOASTER*
Amphibians, Reptiles							
Frog indet.				1			1
Snake indet.				10	2		4
Tortoise indet.					2		1
Chersina angulata	Angulate tortoise	110	226	269	693	119	295
Fish							
Fish indet.		1	8	1	3		1
Galeichthys feliceps	Sea white catfish		3		1		5
Lithognathus lithognathus	White steenbras						4
Rhabdosargus globiceps	White stumpnose					1	
Birds							
Bird indet.		4	12	1	4	3	9
Afrotis afra	Black korhaan						5
Alopochen aegypticus	Egyptian goose						3
Burhinus capensis	Cape dikkop	2					
Corvus capensis	Cape crow						22
Francolinus africanus	Grey-winged francolin				1		13
Francolinus capensis	Cape francolin	6	28	2	6		25
Morus capensis	Cape gannet			1		39	
Phalacrocorax capensis	Cape cormorant			1			
Phoenicopterus ruber rosens	Greater flamingo						2
Spheniscus demersus	African penguin			1	2		1
Struthio camelus	Ostrich		3	1			
Rodents							
Small Rodent		1		12			
Georhycus capensis	Cape mole rat				1		
Rhabdomys pumilio	Striped mouse				1		
Medium Rodent			4			1	
Bathyergus suillus	Cape dune mole rat	14	21	34	22		49
Large Rodent			13			6	
Lepus capensis	Cape hare	17	45	14	18	9	11
Bovids							
Bovid, size class 1	Small bovid	17	408	22	160	35	187
Raphicerus spp.		8	73	191	8	21	11
Raphicerus campestris	Steenbok	11	43	1	5	1	
Raphicerus melanotis	Grysbok		3	1	2		
Sylvicapra grimmia	Duiker	1	4	10	2		4
Bovid, size class 2	Small medium bovid	1	2	5	1	1	13

Sheep / Goat				2			1
Bovid, size class 3	Large medium bovid	4	23	3			6
Bovid, size class 4	Large bovid	1	38		5	48	7
Bos (?)	Cattle					4	
Megalotragus priscus	Giant hartebeest			12			
Taurotragus oryx	Eland			40		54	
Pelorovis antiquus	Giant cape buffalo			6		1	
Size class 0, indet.	Microfauna (0–5 kg)				9		6
Size class 1, indet.	Small fauna (5–20 kg)	6	59	40	113	7	49
Size class 2, indet.	Small medium fauna (20–100 kg)	2	13	18	3		10
Size class 3, indet.	Large medium fauna (100–300 kg)		10	48	6		16
Equus capensis	Cape zebra			2			2
Size class 4, indet.	Large fauna (300–1000 kg)	1		44	8	12	33
Size class 5, indet.	e.g., Rhino, Hippo			23			16
Rhinoceros spp.							4
Diceros bicornis	Black rhino			56			
Size class 6, indet.	e.g., Giraffe, Elephant, Whale			9			50
Loxodonta africana	African elephant			12	3		7
Carnivores							
Small Carnivore			4				1
Galerella pulverulenta	Small grey mongoose	1		4	2		6
Genetta genetta	Small spotted genet			1			
Herpestes ichneumon	Large gray mongoose		1				
Ictonyx striatus	Striped polecat		1	2			1
Mellivora capensis	Honey badger			66			
Medium Canid							4
Medium Felid					6		
Arctocephalus pusillus	Cape fur seal				1		
Indet.							
Worked bone					2		1
TOTAL		**208**	**1045**	**966**	**1092**	**362**	**886**

Tab. 5: Geelbek Dunes.
Detailed faunal analysis. No data available for Check. Key: *Preliminary data.

Marine Shell Code	Common Name	CHECK	NORA	POTTERY	SRHINO	SHELLY	SNOEK	TOASTER	TOTAL
Gastropods									
Gastropod indet.			1	1	1	7			**10**
Bullia digitalis	Plough shell	3		1	1	6			**11**
Burnupena cincta	Whelk		4	3					**7**
Haliotis midae	Perlemoen (abalone)							5	**5**
Turbo cidaris cidaris	Alikreukel (periwinkle)					1			**1**
Patellids									
Limpet indet.						4	1	1	**6**
Dendrofissurella scutellum	Keyhole limpet	2	1	7	4	10	13	15	**52**
Crepidula capensis	Slipper limpet		1			1			**2**
Cymbula granatina	Granite limpet	4		2		56	3	18	**83**
Cymbula oculus	Goat's eye limpet							1	**1**
Scutellestra argenvillei	Argenville's limpet		13			33		6	**52**
Scutellestra barbara	Bearded limpet					2			**2**
Scutellestra cochlear	Pear limpet		2			5			**7**
Scutellestra granularis	Granular limpet		1			31		11	**43**
Bivalves									
Aulacomya ater	Ribbed mussel					4			**4**
Choromytilus meridionalis	Black mussel	373	158	269	58	593	8	83	**1542**
Donax serra	White mussel	1	45	63	2	261	17	25	**414**
Donax serra (retouched)	Tool (scraper)		12	6		66	1	5	**90**
Glycymeris queketti	Dog cockle							1	**1**
Venerupis corrugata	Venus clam	1		1				3	**5**
Crustaceans									
Coronula diadema	Whale barnacle		1	35					**36**
Barnacle indet.	Acorn barnacle		1	1		7			**9**
Jasus lalandii	Crayfish			2		1			**3**
TOTAL		**384**	**240**	**391**	**66**	**1088**	**43**	**174**	**2386**
Bulk shell samples		21	60	19	9	1	1	0	**111**
ALL SHELL		**405**	**300**	**410**	**75**	**1089**	**44**	**174**	**2497**

Tab. 6: Geelbek Dunes.
Analytical results for marine shell.

Lithic Code	CHECK*	NORA	POTTERY	RHINO	SHELLY**	SNOEK***	TOASTER	TOTAL
Tools	6	15	4	31	21	33	8	**118**
Cores	8	1	5	10	43	4	8	**79**
Flakes	73	151	111	505	232	180	118	**1370**
Angular Debris	8	41	22	91	77	4	15	**258**
CHIPPED ARTIFACTS >10 mm	**95**	**208**	**142**	**637**	**373**	**221**	**149**	**1825**
Tool ratio (%)	6	7	3	5	6	15	5	**6**
Small Debris (5–10 mm)	3	471	335	362	580	–	32	**1783**
Microdebitage (<5 mm)	25	204	147	60	195	11	2	**644**
ALL CHIPPED ARTIFACTS	**123**	**883**	**624**	**1059**	**1148**	**232**	**183**	**4252**
Ground Stone Tools	2	2	12	2	27	–	4	**49**
Manuports (unchipped stone)	6	11	13	47	38	7	30	**152**
Geofacts (includes ochre)	17	1	1	–	9	–	24	**52**
TOTAL LITHICS	**148**	**897**	**650**	**1108**	**1222**	**239**	**241**	**4505**

Tab. 7: Geelbek Dunes.
Results of lithic analysis. The percentage of tools is highest at Snoek and lowest at Pottery.
Key: *Preliminary data; **data exclude 873 unanalyzed finds; ***data exclude 31 unanalyzed finds.

Tool Code	CHECK	NORA	POTTERY	RHINO	SHELLY	SNOEK	TOASTER
scraper, large		1		2			
scraper, medium		1	1				
scraper, small		3	1	1	4	2	
scraper, side	4			1	1		
TOTAL SCRAPERS	4	5	2	4	5	2	0
segment	1	4		5	2	2	
backed point	1			2	3	14	
backed bladelet		1		4		8	1
backed blade						4	1
TOTAL BACKED PIECES	2	5	0	11	5	28	2
retouch on flake				10	4		1
retouch on blade						1	1
retouch on bladelet				4			
misc. retouch		1			3		
TOTAL MISC. RETOUCH	0	1	0	14	7	1	2
adze		2	1		3		1
drill				1		1	1
unifacial point (tanged)		1	1				
denticulate				1	1	1	2
indet.		1					
TOTAL MISC. TOOLS	0	4	2	2	4	2	4
TOTAL FORMAL TOOLS	**6**	**15**	**4**	**31**	**21**	**33**	**8**
Backed Tool Ratio (%)	**33**	**33**	**0**	**35**	**24**	**85**	**25**
Scraper & Adze Tool Ratio (%)	**67**	**47**	**75**	**13**	**38**	**6**	**13**

Tab. 8: Geelbek Dunes. Breakdown of formal tools comparing the ratio of backed tools indicative of hunting and the ratio of scrapers and adzes indicating plant and hide working.

Raw Material Code	CHECK*		NORA		POTTERY		RHINO		SHELLY**		SNOEK***		TOASTER		**TOTAL**	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	**n**	%
Calcrete	16	11							41	3			15	6	**72**	2
CCS	3	2	104	12	86	13	5	0.5	329	27			1	0.4	**528**	12
Silcrete	54	36	26	3	26	4	56	5	99	8	217	91	24	10	**502**	11
Granitic/Igneous	9	6	14	2	8	1	348	31	30	2	6	3	23	10	**438**	10
Quartz	58	39	418	47	318	49	579	52	497	41	12	5	120	50	**2002**	44
Quartzite	2	1	320	36	42	6	88	8	173	14			14	6	**639**	14
Metamorphic/Sedimentary	3	2	6	1	164	25	27	2	37	3	2	1	19	8	**258**	6
Other	3	2	9	1	6	1	5	0.5	16	1	2	1	25	10	**66**	1
TOTAL	**148**	100	**897**	100	**650**	100	**1108**	100	**1222**	100	**239**	100	**241**	100	**4505**	100

Tab. 9: Geelbek Dunes.
Summary of raw material types. Key see Table 7.

Locality	Calcrete blocks (n)	Estimated min. number of features
BOVID	39	3
CHECK	203	2
EDM*	1	1
EQUUS	497	3
HEARTH*	na	8
HOMO	424	1
LOOP	25	1
MATILDA ROSE	11	1
NORA	284	1
OLIFANT*	1	1
POTTERY	967	3
RHINO	2	1
SHELLY	609	10
SNOEK	5	1
STELLA*	1	1
STONERING*	1	1
TOASTER	1186	10
TOTAL	**4256**	**49**

Tab. 10: Geelbek Dunes.
Summary of calcrete blocks from all localities and estimated minimum number of features. Key: *Not systematically studied, but location of each feature was plotted; na not applicable.

Bead Code	Description	LOOP	NORA	POTTERY	SHELLY	SNOEK	STELLA	TOASTER	TOTAL
0	indeterminate			1	1				**2**
1	angular blank	1	70	10	58		5		**144**
2	rounded blank		5	14	6				**25**
3	complete, partially drilled blank	1	14	1	22				**38**
4	broken, partially drilled blank		23	1	8				**32**
5	complete, perforated blank		10	2	6			4	**22**
6	broken, perforated blank		45	5	10			1	**61**
7	complete, perforated, slightly formed bead	1	1	60	8				**70**
8	broken, perforated, slightly formed bead		3	1	6				**10**
9	complete, perforated, almost bead form		4	327	14			3	**348**
10	broken, perforated, almost bead form		3	1	10				**14**
11	complete, finished bead	4	8	190	69	1		5	**277**
12	broken, finished bead		1	1	2				**4**
	TOTAL	**7**	**187**	**614**	**220**	**1**	**5**	**13**	**1047**

Tab. 11: Geelbek Dunes.
Tabulation of production stages of ostrich eggshell beads.

Locality	Index	Lab ID	Method	Material	Detail	uncal BP	+/-	cal age	cal +/-	Lab ID	Collagen Yield	$\delta^{13}C$	$\delta^{15}N$	C/N ratio
HETERO	101	GrA-17558	AMS	bone	human tibia	405	40	1510 AD	80	UCT-8070	6.8	-14.8	11.0	3.1
HOMO	103	GrA-13530	AMS	bone	human femur	1100	50	920 AD	60	UCT-8069	5.9	-16.1	12.9	3.2
LOOP	1600	GrA-17565	AMS	bone	human radius	2040	35	50 BC	50	UCT-8071	22.0	-9.8	16.7	3.0

Tab. 12: Geelbek Dunes.
Results from radiocarbon dating and C/N analysis on human remains.

References

Acocks, John P. H. 1988: Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa 57 (Pretoria: Botanical Research Institute).

Avery, Graham 1974: Open station shell midden sites and associated features from the Pearly Beach area, south-western Cape. South African Archaeological Bulletin 29, 104–114.

Avery, Graham, Andrew W. Kandel, Richard G. Klein, Nicholas J. Conard & Kathryn Cruz-Uribe 2004: Tortoises as food and taphonomic elements in palaeo »landscapes«. In: Jean-Philip Brugal & Jean Desse (eds.), Petits animaux et sociétés humaines: du complément alimentaire aux ressources utilitaires (Antibes: Editions APDCA) 147–161.

Binneman, Johan 2000: Results from two test excavations on the Baviaanskloof Mountains, Eastern Cape Province. South African Field Archaeology 9, 83–96.

Buchanan, William F. 1988: Shellfish in Prehistoric Diet: Elands Bay, S. W. Cape Coast, South Africa. Cambridge Monographs in African Archaeology 31 / British Archaeological Reports, International Series 455 (Oxford: British Archaeological Reports).

Budack, Kuno F. R. 1977: The ≠Aonin or Topnaar of the lower !Khuiseb Valley and the sea. African Studies Institute Communications 6 (Johannesburg: University of Witwatersrand) 1–42.

Childe, Vere Gordon 1936: Man makes himself (London: C. A. Watts).

Compton, John S. & Giuliana Franceschini 2005: Holocene geoarchaeology of the Sixteen Mile Beach barrier dunes in the Western Cape, South Africa. Quaternary Research 63, 99–107.

Conard, Nicholas J. 2002: Steinzeitforschung in den Geelbek-Dünen. Archäologie in Deutschland 6/2002, 10–15.

— 2003: Handaxes on the landscape and the reconstruction of Paleolithic settlement patterns. In: Jan Michael Burdukiewicz, Lutz Fiedler, Wolf-Dietrich Heinrich, Antje Justus & Enrico Brühl (eds.), Erkenntnisjäger. Kultur und Umwelt des frühen Menschen. Festschrift für Dietrich Mania. Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie Sachsen-Anhalt 57 (Halle) 123–144.

Conard, Nicholas J., Timothy J. Prindiville & Andrew W. Kandel 1999: The 1998 fieldwork on the Stone Age archaeology and palaeoecology of the Geelbek Dunes, West Coast National Park, South Africa. South African Field Archaeology 8, 35–45.

Conard, Nicholas J., Marie Soressi, John E. Parkington, Royden Yates & Sarah Wurz 2004: Developing a unified lithic taxonomy: results of lithic workshops in Cape Town and Stellenbosch. South African Archaeological Bulletin 59, 12–16.

Copley, Mark S., Fabricio A. Hansel, Karim Sadr & Richard P. Evershed 2004: Organic residue evidence for the processing of marine animal products in pottery vessels from the pre-colonial archaeological site of Kasteelberg D east, South Africa. South African Journal of Science 100, 279–283.

Deacon, Hilary J., Janette Deacon, Mary Brooker & Mike L. Wilson 1978: The evidence for herding at Boomplaas Cave in the Southern Cape, South Africa. South African Archaeological Bulletin 33, 39–65.

Dietl, Holger 2004: Die Freilandfundstellen von Geelbek und Anyskop in Südafrika. Das Siedlungsverhalten während des Middle Stone Age. Unpublished master's thesis (University of Tübingen).

Dietl, Holger, Andrew W. Kandel & Nicholas J. Conard 2005: Middle Stone Age settlement and land use at the open-air sites of Geelbek and Anyskop, South Africa. Journal of African Archaeology 3, 233–244.

Felix-Henningsen, Peter, Andrew W. Kandel & Nicholas J. Conard 2003: The significance of calcretes and paleosols on ancient dunes of the Western Cape, South Africa, as stratigraphic markers and paleoenvironmental indicators. In: György Füleky (ed.), Papers of the 1st International Conference on Soils and Archaeology, Százhalombatta, Hungary, 30 May – 3 June 2001. British Archaeological Reports, International Series 1163 (Oxford: Archaeopress) 45–52.

Floss, Harald 1994: Rohmaterialversorgung im Paläolithikum des Mittelrheingebiets. Monographien des Römisch-Germanischen Zentralmuseums 21 (Bonn: Habelt).

Franceschini, Giuliana 2003: Geology of aeolian and marine deposits in the Saldanha Bay region, Western Cape, South Africa. Unpublished doctoral thesis (University of Cape Town).

Henshilwood, Chris S. 1996: A revised chronology for pastoralism in southernmost Africa: new evidence of sheep at c. 2000 b.p. from Blombos Cave, South Africa. Antiquity 70, 945–949.

Hine, Philip J. 2004: Archaeological excavations at Holbaai, Vredenburg Peninsula, Western Cape: variability and subsistence amongst Later Stone Age groups. Unpublished honor's thesis (University of Cape Town).

Jacobson, Leon 1987: The size variability of ostrich eggshell beads from central Namibia and its relevance as a stylistic and temporal marker. South African Archaeological Bulletin 42, 55–58.

Jerardino, Antonieta 1995: The problem with density values in archaeological analysis: a case study from Tortoise Cave, Western Cape, South Africa. South African Archaeological Bulletin 50, 21–27.

Jerardino, Antonieta & René A. Navarro 2002: Cape rock lobster (*Jasus lalandii*) remains from South African west coast shell middens: preservational factors and possible bias. Journal of Archaeological Science 29, 993-999.

Jerardino, Antonieta & Royden Yates 1996: Preliminary results from excavations at Steenbokfontein cave: implications for past and future research. South African Archaeological Bulletin 51, 7–16.

Kandel, Andrew W. 2004: Modification of ostrich eggs by carnivores and its bearing on the interpretation of archaeological and palaeontological finds. Journal of Archaeological Science 31, 377–391.

Kandel, Andrew W. & Nicholas J. Conard 2003: Scavenging and processing of whale meat and blubber by Later Stone Age people of the Geelbek Dunes, Western Cape. South African Archaeological Bulletin 58, 91–93.

— 2005: Production sequences of ostrich eggshell beads and settlement dynamics in the Geelbek Dunes of the Western Cape, South Africa. Journal of Archaeological Science 32, 1711–1721.

Kandel, Andrew W., Peter Felix-Henningsen & Nicholas J. Conard 2003: An overview of the spatial archaeology of the Geelbek Dunes, Western Cape, South Africa. In: György Füleky (Ed.), Papers of the 1st International Conference on Soils and Archaeology, Százhalombatta, Hungary, 30 May – 3 June 2001. British Archaeological Reports, International Series 1163 (Oxford: Archaeopress) 37–44.

Klein, Richard G. 1972: Preliminary report on the July through September 1970 excavations at Nelson Bay Cave, Plettenberg Bay (Cape Province, South Africa). Palaeoecology of Africa 6, 177–208.

Klein, Richard G. & Kathryn Cruz-Uribe 1989: Faunal evidence for prehistoric herder-forager activities at Kasteelberg, Western Cape Province. South African Archaeological Bulletin 44, 82–97.

Liengme, C. 1987: Botanical remains from archaeological sites in the Western Cape. In: John Parkington & Martin Hall (eds.), Papers in the Prehistory of the Western Cape, South Africa. British Archaeological Reports, International Series 332 (Oxford: British Archaeological Reports) 237–261.

Low, A. Barrie & Anthony G. Rebelo 1996: Vegetation of South Africa, Lesotho and Swaziland (Pretoria: Department of Environmental Affairs and Tourism).

Manhire, Anthony H., John E. Parkington & Timothy S. Robey 1984: Stone tools and sandveld settlement. In: Martin Hall, Graham Avery, D. Margaret Avery, Mike L. Wilson & Anthony J. B. Humphreys (eds.), Frontiers: Southern African Archaeology Today. Cambridge Monographs in African Archaeology 10. British Archaeological Reports, International Series 207 (Oxford: British Archaeological Reports) 111–119.

Parkington, John E. 1976: Coastal settlement between the mouths of the Berg and Olifants rivers, Cape Province. South African Archaeological Bulletin 31, 127–140.

— 1984: Soaqua and Bushmen: Hunters and robbers. In: Carmel Schrire (ed.), Past and Present in Hunter-gatherer studies (New York: Academic Press) 151–174.

Parkington John E., Peter Nilssen, Claire Reeler & Chris Henshilwood 1992: Making sense of space at Dunefield Midden Campsite, Western Cape, South Africa. South African Field Archaeology 1, 63–70.

Parkington, John E. & Simon Hall in press: The appearance of food production in Southern Africa 1000 to 2000 years ago. In: Cambridge History of South Africa.

Patrick, Mary, Adrianus J. de Koning & Andrew B. Smith 1985: Gas liquid chromatographic analysis of fatty acids in food residues from ceramics found in the southwestern Cape, South Africa. Archaeometry 2, 231–236.

Pfeiffer, Susan & Judith Sealy 2005**:** Body size among Holocene foragers of the Cape ecozone, Southern Africa. American Journal of Physical Anthropology 126, 278–294.

Raven-Hart, Roland 1971**:** Cape Good Hope, 1652–1702: The First Fifty Years of Dutch Colonisation as Seen by Callers (Cape Town: A. A. Balkema).

Robertshaw, Peter T. 1977**:** Excavations at Paternoster, south-western Cape. South African Archaeological Bulletin 32, 63–73.

— 1979: Excavations at Duiker Eiland, Vredenburg District, Cape Province. Annals of the Cape Provincial Museums 1/1, 1–26.

Rudner, Jalmar 1968: Strandloper pottery from South and Southwest Africa. Annals of the South African Museum 49, 441–663.

Sadr, Karim 2004: Feasting on Kasteelberg? Early herders on the west coast of South Africa. Before Farming 3/2, 1–17.

Sadr, Karim & Andrew B. Smith 1991: On ceramic variation in the south-western Cape, South Africa. South African Archaeological Bulletin 46, 107–114.

Sadr, Karim, Andrew B. Smith, Ina Plug, Jayson Orton & Belinda Mütti 2003: Herders and foragers on Kasteelberg: Interim report of excavations 1999–2002. South African Archaeological Bulletin 58, 27–32.

Sampson, C. Garth & Karim Sadr 1999: On the size and shape of Later Stone Age fibre-tempered vessels from the Upper Seacow Valley. South African Field Archaeology 8, 3–16.

Schweitzer, Frank R. 1979: Excavations at Die Kelders, Cape Province, South Africa: the Holocene deposits. Annals of the South African Museum 78, 101–223.

Sealy, Judith, Tim Maggs, Antonieta Jerardino & Jonathan Kaplan 2004: Excavations at Melkbosstrand: variability among herder sites on Table Bay, South Africa. South African Archaeological Bulletin 59, 17–28.

Sealy, Judith & Nikolaas J. van der Merwe 1987: Stable carbon isotopes, Later Stone Age diets and seasonal mobility in the south-western Cape. In: John Parkington & Martin Hall (eds.), Papers in the Prehistory of the Western Cape. British Archaeological Reports, International Series 332 (Oxford: British Archaeological Reports) 262–268.

Skead, C. John 1980: Historical Mammal Incidence in the Cape Province. Vol. 1. (Cape Town: Dept. of Nature and Environmental Conservation of the Provincial Administration of the Cape of Good Hope).

Smith, Andrew B. 1998: Early domestic stock in Southern Africa: a commentary. The African Archaeological Review 15/2, 151–156.

— 2005: African Herders: Emergence of Pastoral Traditions. African Archaeology Series 8 (Walnut Creek: AltaMira Press).

Smith, Andrew B., Karim Sadr, John Gribble & Royden Yates 1991: Excavations in the south-western Cape, South Africa and the archaeological identity of prehistoric hunter-gatherers within the last 2000 years. South African Archaeological Bulletin 46, 71–91.

Stewart, Brian A. 2005: Charring patterns on reconstructed ceramics from Dunefield Midden: implications for Khoekhoe vessel form and function. Before Farming 1/1, 1–18.

Thom, Hendrik B. 1952: Journal of Jan van Riebeeck. Vol. I, 1651–1655 (Cape Town: A. A. Balkema).

Tonner, Tobias W. W. 2005: Later Stone Age shellfishing behaviour at Dunefield Midden (Western Cape, South Africa). Journal of Archaeological Science 32, 1390–1407.

Uerpmann, Margarethe, Hans-Peter Uerpmann & Sabah A. Jasim 2000: Stone Age nomadism in SE-Arabia – palaeo-economic considerations on the Neolithic site of Al-Buhais 18 in the Emirate of Sharjah, UAE. Proceedings of the Seminar for Arabian Studies 30, 229–234.

Vogel, John C., Ebbie Visser & Annemarie Fuls 2001: Suitability of ostrich eggshell for radiocarbon dating. Radiocarbon 43, 133–137.

Webley, Lita 2002: The re-excavation of Spoegrivier Cave on the West Coast of South Africa. Annals of the Eastern Cape Museums 2, 19–49.

Yellen, John E. & Richard B. Lee 1976: The Dobe-/Du/Da environment: background to a hunting and gathering way of life. In: Richard B. Lee & Irven DeVore (eds.), Kalahari hunter-gatherers: Studies of the !Kung San and their Neighbors (Cambridge, Mass.: Harvard University Press) 27–46.