

# Prehistoric Exploitation of Marine Resources in Southern Africa with Particular Reference to Shellfish Gathering: Opportunities and Continuities

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This paper discusses three case studies in which marine resources played an important role in human development in southern Africa over the last 164 ka: the ability of modern humans to exit successfully from Africa is seen partly as the result of a foraging expansion from rocky shores to sandy beaches; the location of an aggregation site close to the coast in the context of low human densities during post-glacial times allowed people to meet social needs and ensure population survival; and a heavy reliance on marine resources supported highest populations levels during the late Holocene. Broader and related issues are also discussed.

## KEYWORDS

COASTAL ARCHAEOLOGY, OUT OF AFRICA, AGGREGATION SITE, PLEISTOCENE/ HOLOCENE TRANSITION, RESOURCE INTENSIFICATION, MEGAMIDDENS.

Este artículo se centra en la discusión de tres casos de estudio en los cuales los recursos marinos desempeñaron un rol importante en el desarrollo humano del sur de África desde hace 164 ka. La capacidad de los humanos modernos de emigrar fuera de África se ve, en parte, como una expansión en la capacidad de forrajeo inicialmente expresada en el litoral rocoso para incluir más tarde las costas de playas de arena. La selección de un hábitat cercano a la costa, donde se congregaban grupos diversos dentro de un marco de bajas densidades poblacionales inmediatamente después de la última glaciación, permitió que esos grupos pudieran cumplir con sus necesidades sociales básicas y así asegurar la supervivencia de la población. Del mismo modo, durante el Holoceno observamos un consumo significativamente alto de recursos marinos como consecuencia del considerable incremento demográfico de los grupos humanos. Otros temas relacionados y un poco más generales son igualmente discutidos.

## PALABRAS CLAVE

ARQUEOLOGÍA DE COSTAS, SALIDA DE ÁFRICA, LUGAR DE CONGREGACIÓN, TRANSICIÓN PLEISTOCENO/HOLOCENO, INTENSIFICACIÓN DE RECURSOS, MEGACONCHEROS.

## Introduction

Coastal caves sites and shell middens have been at the centre of some of the most important Later Stone Age (LSA) and Middle Stone Age (MSA) archaeological research done in southern Africa. Particularly over the last 30 years, much of this literature reflects good reporting of faunal contents of both vertebrate and invertebrate species, often documenting their frequencies, and at times also average sizes of molluscs, fish and other species. Of course, material culture is also routinely described (e.g., Inskeep, 1987; Manhire, 1984; Orton, 2006; Rudner, 1968; Sadr & Smith, 1991), as is sometimes the case with features and spatial layout of camp sites (Jerardino *et al.*, 2009; Parkington *et al.*, 1992; Sealy *et al.*, 2002). But of particular interest here is the need to explore the importance of marine resources to prehistoric foragers who occupied southern Africa for many millennia until 2000 years ago when indications of a herding economy appear for the first time in the local archaeological record. When reflecting about the importance of marine resources to prehistoric foragers in southern Africa, relevant questions are not general but rather specific in nature: were marine resources procured and consumed simply because they were available whenever people happen to visit the coast, and does this type of opportunistic foraging behaviour characterize the use of marine food resources (continuities) during much of the prehistory of southern Africa? Alternatively, we can also ask whether there were times when marine resources were key to social imperatives (opportunities) and evolutionary and/or cultural changes, and if so, whether any co-occurring variables were also at play.

Despite a several interpretative frameworks available in the international literature (e.g., Bailey, 1978; Erlandson, 2001, Perlman, 1980; Sauer, 1962), there have been a few attempts to model or conceptualize the importance of marine subsistence resources in southern Africa during prehistory beyond the adaptationist approach. This is probably the result of the strong influence that the generalized foraging model, based on the Kalahari San ethnography (Lee, 1979; Lee & DeVore, 1968), has had on archaeologists working in southern Africa. Despite its very different and marginal environmental setting (among several other problem areas, see Kelly, 1995), the generalized foraging model and Cultural Ecology studies were accepted as the lens through which much of the coastal archaeological data was interpreted over the last thirty years. More importantly for archaeologists, the generalized foraging model, and Cultural Ecology studies in particular, left little room for detecting diachronic changes as foragers were seen as pristine, isolated and self sufficient units in near equilibrium with their environment (Kelly, 1995: chapter 2). Moreover, pervasive preconceptions among archaeologists in general presenting coastlines and marine resources as marginal have also compounded this problem over the years (Bailey, 2004; Erlandson, 2001). In keeping within the scope of the generalized foraging model, authors have described coastal foragers in terms of the main constituents of their diets, how species were procured, processed and later used in more than one way (Avery, 1985; Binneman, 2001, 2004/2005; Buchanan, 1988; Dewar, 2008; Henshilwood *et al.*, 2001; Inskeep, 1987;

Jerardino, 1996; Kinahan, 1991; Kinahan & Kinahan, 1984; Klein & Cruz-Uribe, 1996; Parkington *et al.*, 1988; Smith, 1993; Smith & Kinahan, 1984; Smith *et al.*, 1992), how vulnerable some of the coastal resources were to human harvesting pressure (Avery *et al.* 2008; Horwitz *et al.*, 1991; Jerardino *et al.*, 2008; Klein & Steele, 2008; Klein *et al.*, 2004), and how their diversity and intake varied with an approaching coastline as a result of post glacial sea level rise or other environmental variables (Lee-Thorp *et al.*, 1989; Parkington, 1976; 1981; 1988; Parkington *et al.* 1988; Sealy & Van der Merwe, 1988). Nevertheless, some authors have conceptualized possible foraging limitations along the coast in the context of culture contact between hunter-gatherers and pastoralists (Parkington *et al.*, 1986), heavy reliance on high-trophic-level marine protein (e.g., seals, predator fish) as an indicator of possible territorial circumscription (Sealy, 2006), acquisition of marine resources being key to brain development of modern humans due to the rich fatty acids they contain (Broadhurst *et al.*, 2002), while others have pointed to the possibility that marine molluscs might have been crucial for the survival of early humans during MIS6 adverse terrestrial glacial conditions (Marean *et al.*, 2007). These are a few attempts to model the use of marine food resources beyond the stasis offered by the generalized foraging model, but their numbers are few and their formulations are still sketchy.

This paper offers some frameworks for further modelling of coastal subsistence in southern Africa through the presentation of three case studies dating within the last 165 ka. Adaptation and environmental variables are still considered but are not seen as the only variables shaping evolutionary and/or cultural changes. These case studies and the discussion that follows attempts to show that there were times during prehistory when marine resources, particularly shellfish, were more than simply another and obvious source of food for hunter-gatherers when passing by coastal settings. A brief description of southern African coastlines sets the stage and background to this argument.

## Southern Africa coastline

Stretching over approximately 4000 km, it extends from northern Namibia to the southern Mozambique and projects southward at Cape Agulhas no further than 35° S on the southernmost tip of the subcontinent. This exposed coastline has few significant shelters along the west coast which are afforded by relatively small lagoonal systems at Walvis Bay, Sandwich Harbour and Saldanha Bay/ Langebaan Lagoon, False Bay in the extreme southwest, and a series of half-heart bays along the east coast (e.g., Algoa Bay at Port Elizabeth). The latter provide little protection from wave action, though (fig. 1).

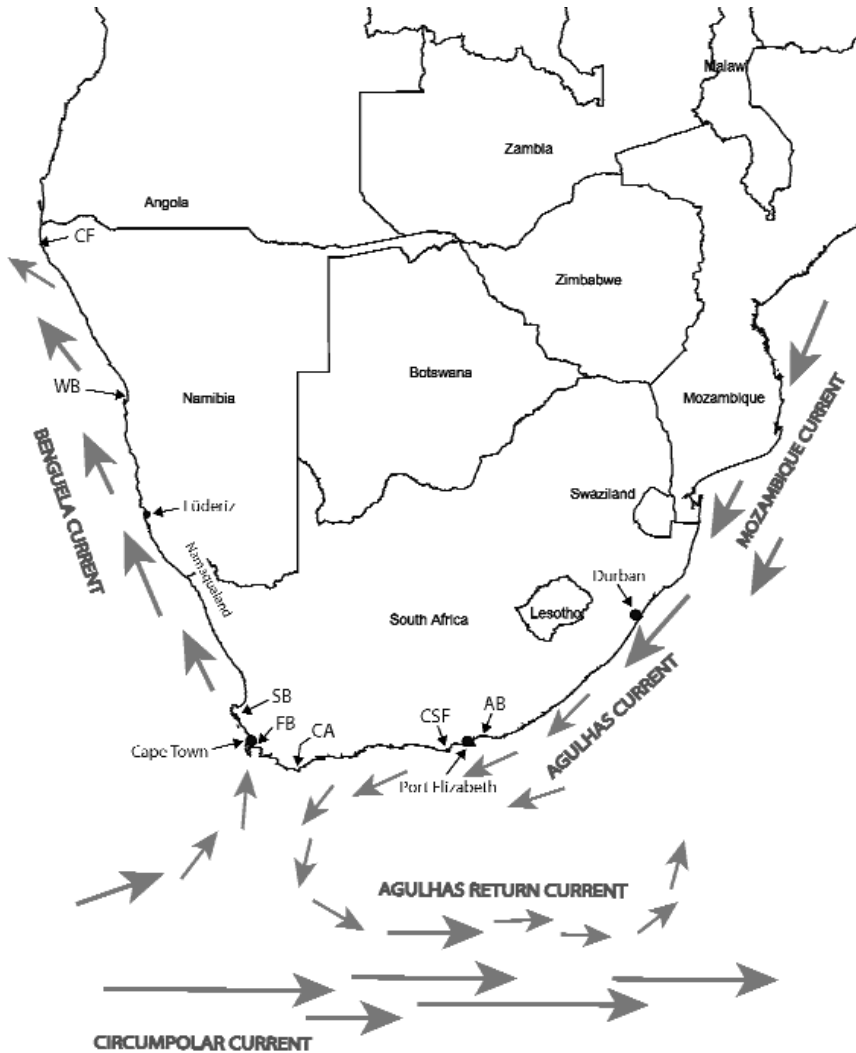
Three main types of habitat characterize this long shoreline, namely sandy beaches, rocky shores and mixed shores that include cliffs with sandy bases, sandy habitats overlying wave-cut rocky platforms and mixed boulder shores. Excluding southern Namibia

for which incomplete data is available, 42 % of this coastline consists of open sandy beach, 27 % of rocky shore and close to 31 % of the mixed type. Muddy shores are extremely rare outside the few lagoonal areas, with cobble/ pebble beaches comprising less than 1 % of the coastline (Bally *et al.*, 1984).

Two current systems dominate southern Africa's shorelines: the Benguela Current exerts influence along the west coast from approximately Cape Agulhas to southern Angola, and the Agulhas Current (deriving from the Mozambique Current) shaping much of the ocean climate and ecology of the east coast and also much of the south coast. A region of overlap exists between the cool Benguela Current and relatively warm south coast in the extreme south west between Cape Agulhas and the Cape of Good Hope (fig. 1). The Agulhas Bank stretches broadly between Cape Agulhas and Port Elizabeth and has a depth of 20 to 50 meters. Given its shallowness, a massive stretch of land would easily become available during pronounced episodes of low sea levels, such as during glacial times (see below). Much of the Benguela Current is dominated by upwelling, with several major upwelling cells situated just south of Cape Town, at Britannia Bay just north of Saldanha Bay, Namaqualand south of the Orange River, along the coast of Lüderiz and between Walvis Bay and Cape Fria in Namibia (fig. 1). Sea surface temperatures (SST) range between 8 and 14 °C through the length of this coastline whereas temperatures between 15 to 22 °C are common in the south coast and between 22 and 27 °C in the east coast (Field & Griffiths, 1991).

A particularly rich marine flora and fauna of over 12,000 species (or nearly 6 % of all known coastal species known world-wide) are known for southern Africa. Some species have distributions that cross the boundaries formed by the two dominant ocean currents (particularly vertebrate species), but marked differences are evident between the west and east coasts. This is particularly the case for marine invertebrate species and algae that grow on rocky substrate, and from which much of the forger livelihood was derived in the past (Jerardino, 2003; Jerardino *et al.*, 2008). Large-scale patterns of community structure of the intertidal rocky shores of southern Africa have been observed (Bustamante & Branch, 1996) with three main biogeographic provinces being described: the west coast or *Namaqua* province, the south coast or *Agulhas* province and the east coast or *Natal* province. Average west coast rocky shore biomass is significantly greater than those of the other two provinces, although species diversity is greater in the south and east coasts. Local variation in biomass and species diversity within all biogeographic provinces correspond with the intensity of local wave action, with exposed shores dominated by fewer species and sustaining community biomasses of one order of magnitude greater than those present on sheltered shores (Bustamante & Branch, 1996; Bustamante *et al.*, 1997).

Marine birds and fish are common and their numbers must have been much higher before the settlement of Europeans in southern Africa since the sixteenth century (Griffiths *et al.*, 2004). Estuaries are productive systems that support plant growth and provide shelter and nutrients to fish larvae and juveniles that later live along the shore and/or open sea (Heemstra & Heemstra, 2004). Small rockeries and embayments afford excellent conditions for the settlement of marine mammal colonies and haul-out locations as well as



**Fig. 1.** Map of southern Africa showing geographic localities, and oceanic currents mentioned in the text: CF, Cape Fria; WB, Walvis Bay; SB, Saldanha Bay; FB, False Bay; CA, Cape Agulhas; CFS, Cape St. Francis; AB, Algoa Bay. The Cape of Good Hope is situated immediately south of Cape Town.

roosting and nesting spots for marine birds. Many rivers and streams traverse the coastal plains forming open or blind estuaries, which maintain a high water table that often attract diverse wildlife. Even in the semi-dry and desert environments of Namaqualand and Namibia, their rare presence brings important foraging opportunities of animal and plant food as well as providing an important source of drinking water.

Number and density of terrestrial species most often procured by southern African coastal foragers (e.g., Klein & Cruz-Uribe, 1987, 1996) vary with plant cover which in turn follows broadly the season and extent (geographic and intensity) of rain falls. Different weather regimes characterize broadly each of the biogeographical provinces mentioned earlier, with winter rainfall being the signature of the west coast and with decreasing quantities in a northerly direction, an all-year round rain pattern along the south coast, and an essentially summer-rain fall system along the east coast. Although many different vertebrate species have adapted to the terrestrial ecosystems shaped largely by the dominant weather regimes, only a relatively small number of these were hunted in the past and no more than a dozen were relied upon on a more systematic basis. Several species of ungulates of different sizes and tortoises common to the coastal fringes and plain make much of the archaeofaunas excavated from the west and south coast (e.g., Avery *et al.*, 2008; Klein & Cruz-Uribe, 1987; Steele & Klein, 2005).

## Case studies

### The early use of marine resources and human migration out of Africa

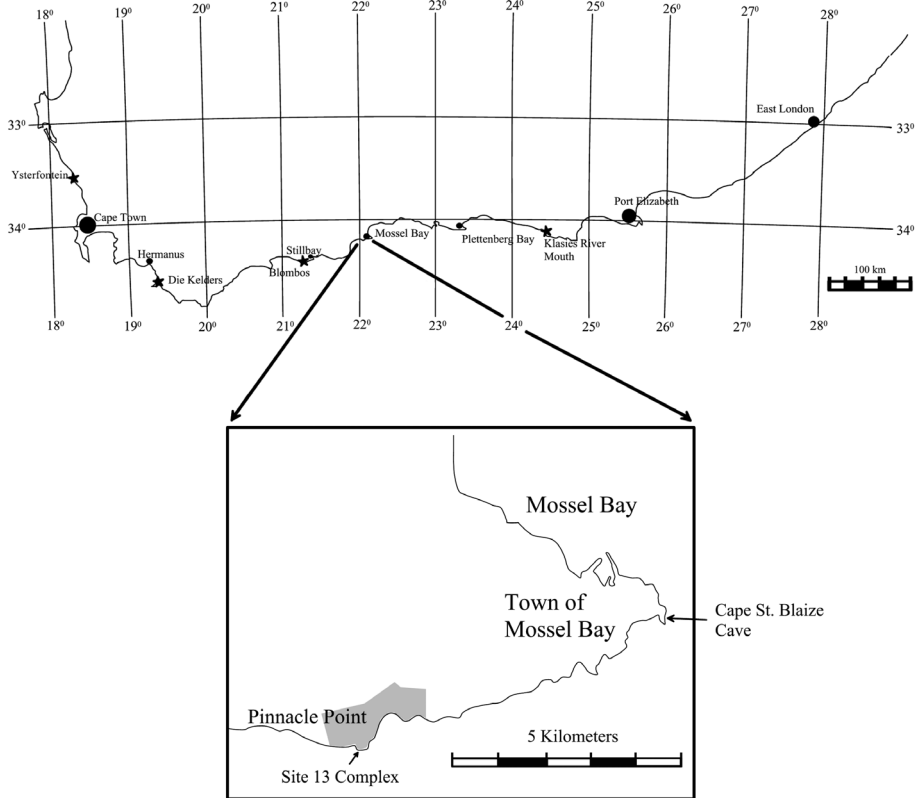
As it is well known in the palaeoanthropological literature, at least two hominid species were able to exit from Africa, from where they had initially evolved. *Homo erectus* dispersed to the middle East and Eurasia about 1,8 million years ago or shortly before, and then modern humans, *Homo sapiens sapiens*, exited Africa by about 80-70 ka (Behar *et al.*, 2008; Forster, 2004; Marean & Assefa, 2005). It is likely that earlier excursions of modest reach did take place as evidenced by the presence of archaic modern humans in the Levant dating to about 90 ka (Klein, 2008; Marean & Assefa, 2005). The routes out of Africa suggested for the second migration include northward movements up the Nile corridor and into the Sinai Peninsula (Klein, 2008; McBrearty, 2007), from east Africa and across the southern Red Sea Basin through Bab al-Mandab Strait (Bailey *et al.*, 2007; Klein, 2008), across the Sahara and into the Mediterranean coast following now buried river channels (Osborne *et al.*, 2008), and also along a coastal route (Erlandson, 2001; McBrearty, 2007; Stringer, 2000).

Some authors (Erlandson, 2001; Jerardino & Marean, in press) have suggested that the systematic use of marine resources by MSA *Homo sapiens* appears to have been part of a more broad-based economic strategy that supported population growth and demographic expansion of this species into the rest of the world. A rich marine biota, including molluscs, fish, birds and sea mammals are often cited as the components of a «Garden of Eden» that would have provided a safety net (if not more) to MSA groups in the face of low terrestrial productivity (e.g., Marean *et al.*, 2007). But Erlandson (2001: 331) argues that

«...the factors that govern human decisions about what resources will be used, when, and by whom are highly complex and situational...», particularly given the flexibility and opportunism with which foragers can behave when encountering a wide range of marine and terrestrial environments. Scavenging of stranded sea birds, cetaceans and other sea mammals has been argued to have been within reach of MSA behavioral capacities as their ability for full-scale and active hunting has not been agreed upon by all (Faith, 2008; Marean & Cleghorn, 2003; Klein, 2001, 2008). Access to recently washed up dead animals is contingent on a number of variables (e.g., currents, tidal movements, other predators, etc.) resulting in an unreliable source of food. On the other hand, rocky shore molluscs are one of the most predictable and reliable resources along coasts, but their distribution can be patchy and restricted by the availability of a suitable substrate which is not always present when vast stretches of coastlines are considered. Often, as indicated above, long tracts of sandy shores, and sometimes mangroves as well as steep cliffs, separate accessible rocky platforms with variable densities of shellfish colonies. What would have then actually taken for early modern humans to follow the coast, at least for significant stretches, successfully out of Africa?

While non-hominids (e.g., baboons and sea gulls) and other hominids are known to have collected marine molluscs and other marine fauna (Davidge, 1978; DeVore & Hall, 1965; Hockey & Bosman, 1988; Erlandson, 2001; Erlandson & Moss, 2001; Joordens *et al.*, 2009; Siegfried, 1977; Stiner, 1994; Stringer *et al.*, 2008), their systematic collection leading to the successive accumulation in one location of relatively dense shell middens is a consistent pattern associated with modern human agency. This is clearly exemplified with the many documented MSA coastal sites in South Africa (Avery *et al.*, 2008; Erlandson, 2001; Henshilwood *et al.* 2001; Jerardino & Marean, in press; Thackeray, 1988; Volman, 1978). Arguably, such recognizable archaeological features are a reflection of a systematic and sustained food procurement strategy that reflects behavioural traits beyond the opportunism with which other hominids and predators have had access to a similar range of marine biota. Moreover, even if the existence of reliable supplies of marine resources could be proven at a time of territorial expansions out of Africa, such availability is not necessarily a straight forward explanation, as the capacity for exploiting such resources profitably is a precondition for their effective incorporation into human diet. This is an assumption that is often accepted and goes unchecked, perhaps because of the apparent uncomplicated manner with which some coastal resources can be procured (Erlandson, 2001).

The diversity of mollusc species found at MSA sites in southern Africa varies greatly from site to site (fig. 2), with Klasies River Mouth (KRM) showing a long list of species (Thackeray, 1988; Voigt, 1982), while others, such as PP13B at Pinnacle Point (Jerardino & Marean, in press), Blombos Cave (Henshilwood *et al.*, 2001) and Ysterfontein 1 (YFT1) (Avery *et al.*, 2008) presenting more modest numbers of species. However, when only the most frequent species are taken into account, no more than 4 to 7 species dominate these assemblages. Although rocky shore species, such as mussels (e.g., *Perna perna*, *Choromytilus meridionalis*), limpets (from the genus *Cymbula* and *Scutellastra*), turban snails (*Turbo sar-*



**Fig. 2.** Map of the south western and part of eastern Cape coastline of South Africa showing localities and MSA Sites mentioned in the text.

*maticus*) and variable quantities of whelks (*Burnupena* spp.) and winkles (*Oxystele* spp) make the bulk of many of the analyzed samples, there are instances when sandy shore species (e.g., *Donax serra*) dominate overwhelmingly. At PP13B, *D. serra* (also known as «white mussel») frequencies vary between 56 % and 79 % by shell weight and between 60 % and 80 % by MNI count in the Eastern Area of this site dating to about 100 and 110 ka by way of OSL measurements (Jerardino & Marean, in press). *D. serra*, while rare overall at KRM, dominates the shellfish assemblage with a short and strong spike in abundance around 70 % (Thackeray, 1988: fig 1, quantifying method not specified) just before member RF that precedes the horizons containing the technological complex known as Howiesons Poort (HP). Based on recent high precision OSL dating of this and other MSA techno-complexes (Jacobs *et al.*, 2008), the spike in *D. serra* abundance at KRM appears to date to about 70 ka or slightly earlier. Small quantities of *D. serra*, on the other hand are recorded from BBC (2 % by shell weight) around 73 ka (Henshilwood *et al.*, 2001) and from YFT1 (2 % by MNI counts) (Avery *et al.*, 2008) around 110 ka.



Although sea level regression and the concomitant development of sandy beaches have been argued to explain the occurrence of *D. serra* at both PP13B and KRM (and most likely for BBC and YFT1) (Jerardino & Marean, in press), the ability by MSA people to exploit this new type of shoreline and resource is a pre-condition for *D. serra* inclusion in the archaeological record. But what would have taken for this to have been the case? At this point we must look into the ecology and the procurement of this species.

*D. serra* is a sandy dweller and occurs in variable concentrations in exposed sandy beaches along the west and south coasts of South Africa (Kilburn & Rippey, 1982; McLachlan & Hanekom, 1979). In the south coast, this species occupies the mid-intertidal zone, while along the west coast it is found deeper within the lower intertidal and shallow subtidal zone (McLachlan & Hanekom, 1979; McLachlan *et al.* 1979; Donn & Els, 1990). Easier access to this particular resource along the south coast appears also to have been the case several millennia ago as reflected by their higher frequencies in nearby LSA shell middens when compared to their equivalent along the west coast (Binneman, 2004/2005; Döckel, 1998; Jerardino *et al.*, 2009). Foraging for *D. serra* involves walking down the beach slope about mean tide level and touching gently with the feet, as this species burrows down quickly when disturbed. This is an ability that *Donax* species have evolved in order to maintain their position on highly dynamic beaches (Donn & Els, 1990). Smaller individuals (30-45 mm in shell length) burrow at sand depths of 0-7 cm while larger individuals (45-60 mm shell length) are found between 7 and 15 cm into the sand (McLachlan & Hanekom, 1979). Once a patch of *D. serra* is located, people dig quickly with their hands and grab as many shellfish as possible before many of them can burrow further down into the sand. This collection method is used currently by local fishermen in search for bait and snacking (Kilburn & Rippey, 1982).

The collection of *D. serra* requires walking down the beach profile at about hip level (or higher in the case of relatively short people such as indigenous southern San groups) and dealing with full wave action. The aid of a container and/or another person helping to receive the catch can assist with larger catches of *D. serra*. Rocky inter-tidal species, on the other hand, are largely visible, fixed to rocks to a large degree, and their collection entails relatively shallow entry into the water during low tides in most cases. Containers are not always immediately necessary during collection as catches are often piled higher up the rocks for later collection and transport to camp (with or without the help of containers). Also, the aid of a helper is rarely needed when harvesting molluscs from rocks. Clearly, the procurement of *D. serra* involves more than simple foraging on a semi-encounter basis. Instead, it seems to involve more complex decision-making requiring anticipation, planning and possibly also additional help in the form of dilly bags and/or cooperation with others. Some could argue that shellfish collection along rocky shores probably required dealing effectively with the same set of variables, for instance, the observation of moon cycles for predicting tidal movements. Nevertheless, rocky shore molluscs can and are harvested when colonies are not fully exposed by low tides (Bigalke, 1973; Durán *et al.*, 1987; Siegfried *et al.*, 1985). Hence, it appears that the harvest of *substantial* numbers of *D. serra*

(as seen in the MSA sites mentioned above) cannot happen without anticipating, planning, providing bags for containing the catch and possibly also cooperating with others. In the context of the procurement of hunted species, these skills and abilities are usually indicative of an aspect of behavioural modernity (McBrearty & Brooks, 2000). More conclusive data based on taphonomic studies and well-designed actualistic studies should bring more clarity on this issue (Bird *et al.*, 2002; Bird & Bliege-Bird, 1997).

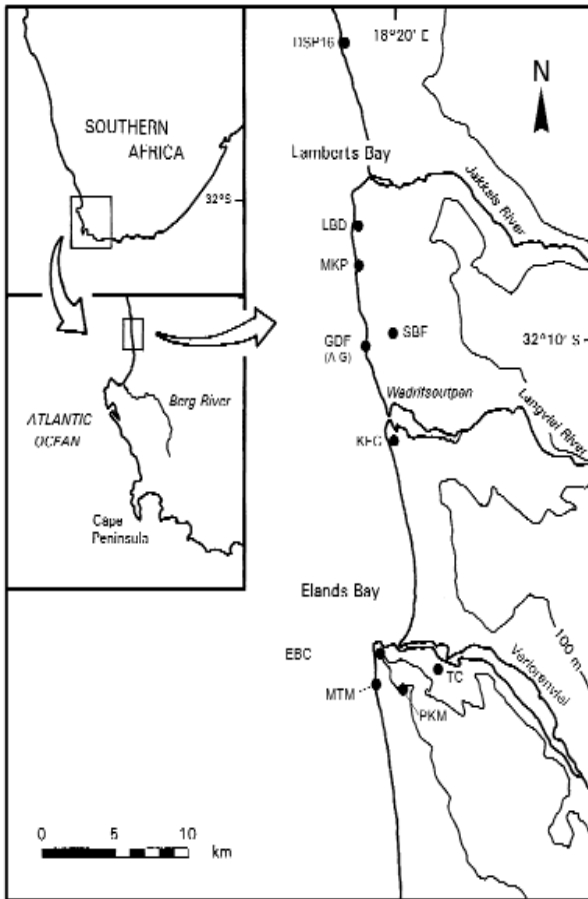
Modern humans had started to broaden their resource base in terms of shellfish species by 110 ka, and were able to exploit both rocky shore and sandy beaches actively as opposed to the more passive approach allowed by scavenging of sea mammals and possibly also of other species along the same coastal environment. The latter procurement method would have offered only sporadic and unpredictable subsistence opportunities, while knowledge on moon and tidal cycles, the ecology of sandy shore species, such as *D. serra*, and the ability and skill to harvest them in large enough numbers along with rocky shore species would have assisted in the use of coastlines for territorial expansion and human migration out of Africa. Obviously, the palaeoenvironmental configuration of the coastal landscape, access to drinking water and the need for balancing the diet with terrestrial resources might have posed limitations on coastal routes at different times. The argument offered here doesn't preclude from alternative inland routes to have been explored broadly at the same time. Rather, it establishes the possibility that a coastal route might well have been used to exit Africa through a more detailed discussion of what would have taken for such a choice to have been the case and beyond assumptions and speculation. As argued here, coastal environments and marine resources offered such an opportunity to modern humans since at least 110 ka.

## When social needs were met during the Terminal Pleistocene

### Settlement patterns

A large number of caves, shelters and open sites have been recorded for the Elands Bay and Lamberts Bay areas, and the vast majority of these sites consist of Holocene deposits dominated by marine shell remains (fig. 3). The rate at which these deposits were accumulated in the past has changed considerably since the recovery and relative stabilization of sea levels after the Last Glacial Maximum (LGM) around 8000 years ago (fig. 4).

Among the sites that were not destroyed by the rapid sea level rise at the end of the Pleistocene, earliest evidence for LSA occupation in the study area is found at Elands Bay Cave (EBC) with the presence of loam deposits dating to between 17 500 and 20 000 BP (Parkington, 1988, 1990). Given the great depth of Steenbokfontein Cave undated deposits below 8000 BP radiocarbon-dated levels, it is very likely that these early dates are also



**Fig. 3.** Map of the Elands Bay and Lamberts Bay areas showing location of sites and places mentioned in the text and tables. Megamiddens: Cape Deseada Midden, CDM; Doorspring 16, DSP16; Grootrif (A-D) middens, GF; Kreeftbaai C, KFC; Lambertsbay Dump, LBD; Malkoppan, MKP; Mike Taylor’s Midden; Steenbokfontein, SBF; Tortoise Cave, TC. Two other megamiddens are situated in close proximity to EBC and MTM, respectively.

reflected there, but only further excavations at this site will confirm this. Available section drawings and description of this early sequence at EBC indicate low accumulation rates reflecting very sporadic visits at this time when EBC was essentially an inland site, cooler and wetter conditions were dominant, and the local environment supported a variety of animals, including large grazers (table 1). Intermittent occupation of sites further inland is suggested by a 16 500 BP radiocarbon-dated occupation from Faraoskop (Manhire, 1993).

After an apparent occupational hiatus between 17 500 and 13 500 BP, visits to EBC were resumed once again when the shoreline was situated about 16 km to the west. Occupation of EBC continued to be infrequent until about 11 000 BP when the earliest lenses of marine shells appear in the stratigraphic sequence and the coastline was about 5 km away. The inclusion of increasing quantities of marine shells thereafter was concomitant with depositional rates of at least one order of magnitude higher. Although this could be explained by a change in the sedimentary matrix rather than a reflection of site

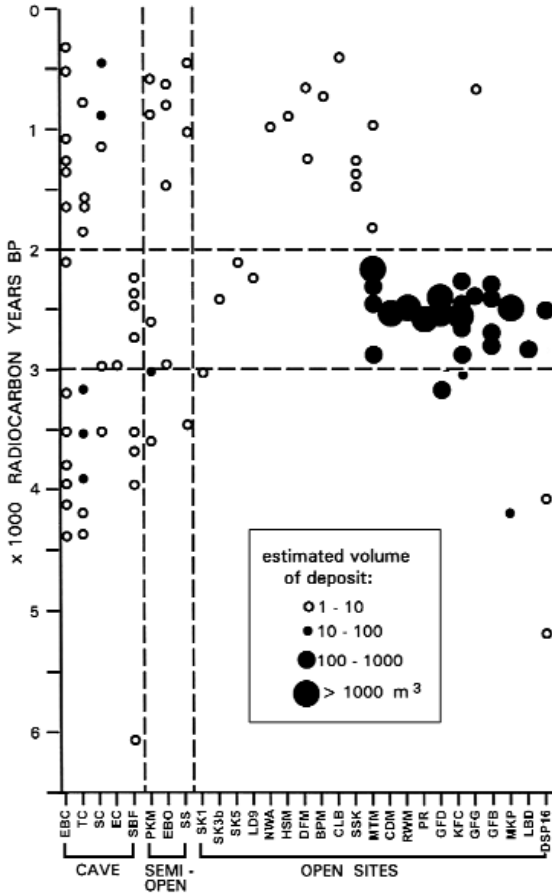


Fig. 4. Intensity of site occupation in the study area as measured by volumes of deposit (uncalibrated radiocarbon years BP).

usage (Parkington, 1988, 1990), frequency estimates of lithic (flaked stone artefacts, grindstones and other on-site manufacturing stone tools, and ochre) and non-lithic artefacts (beads and pendants made of ostrich eggshell, marine shell and bone, as well as fish gorges and other bone tools), vertebrate faunal remains of marine (e.g., seals, cormorants and fish) and terrestrial origin (e.g., tortoises, bovinds of all sizes), and un-worked ostrich egg shell (OES) fragments also indicate faster depositional rates reflecting a greater intensity of site usage between 11 000 and 8500 BP as the coastline advanced from about 5 km to a few hundred meters from this site (Parkington, 1981, 1988, 1990). In fact, rough estimates indicate that about half of EBC deposits date to this period, an equivalent of about 50 m<sup>3</sup> (Parkington, 1990).

The observed increase in finished ostrich eggshell (OES) beads and pendants lost on site, unfinished OES beads and evidence for on-site manufacturing reflected in grindstones, whetstones, palettes and rubbers (Parkington 1988), suggest not only more frequent vis-

**Table 1.** Number of Identifiable Specimens (NISP)/ Minimum Number of Individuals (MNI) of mammals and tortoises at Elands Bay Cave. Total NISP for tortoises are not available and MNIs are based on humeri. Observations updated since Klein & Cruz-Urbe (1987) (Klein pers. comm., 2009).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Hedgehog ( <i>Eriacus frontalis</i> )	-	-	-	1/1	1/1	-	-	-	1/1	11/3	1/3	1/1	68/8	5/2	25/5	7/2	1/1	4/1	-	-	-	-	-
Hare(s) ( <i>Leporidae</i> gen. et sp. indet.)	3/1	-	3/1	9/2	3/1	5/1	-	13/1	4/1	11/2	11/1	4/1	75/4	5/2	34/3	19/2	5/1	6/1	1/1	-	-	-	-
Cape dune molecat ( <i>Batyergus sulillus</i> )	2/1	1/1	8/1	3/2	8/1	15/3	2/1	19/2	78/5	35/5	216/13	6/1	486/34	82/7	1474/71	118/9	46/3	86/6	24/4	3/1	-	-	-
Porcupine ( <i>Hystrix africaeaustralis</i> )	-	-	-	3/1	-	1/1	-	4/1	1/1	-	-	1/1	6/1	-	26/2	-	4/1	2/1	-	1/1	-	-	-
Baboon ( <i>Papio ursinus</i> )	-	-	1/1	9/1	2/1	1/1	-	3/1	-	1/1	1/1	-	3/1	-	12/2	7/1	-	-	-	-	-	-	-
Cape fur seal ( <i>Acrocephalus pusillus</i> )	16/4	63/2	217/5	596/11	132/4	69/3	9/1	56/3	71/3	259/6	137/3	11/1	438/69	47/4	245/6	43/3	4/1	1/1	3/1	-	-	-	-
Black-backed jackal ( <i>Canis mesomelas</i> )	1/1	-	1/1	8/1	-	4/1	2/1	9/1	2/1	3/1	1/1	-	29/2	1/1	4/1	-	-	-	-	1/1	-	-	-
Cape fox ( <i>Vulpes chama</i> )	-	-	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	-	-	-	-	-	-
Striped polecat ( <i>Ictonyx striatus</i> )	-	-	1/1	-	-	-	-	-	1/1	-	6/2	-	11/2	2/1	15/2	6/2	-	-	-	-	-	-	-
Honey badger ( <i>Mellivora capensis</i> )	-	-	-	-	-	1/1	-	1/1	-	1/1	-	-	-	-	1/1	1/1	-	2/1	-	-	-	-	-
Egyptian mongoose ( <i>Herpestes ichneumon</i> )	-	-	-	-	1/1	-	-	-	-	-	1/1	-	2/1	-	-	-	-	-	-	-	-	-	-
Gray mongoose ( <i>Herpestes pulverulentus</i> )	1/1	1/1	1/1	5/1	3/1	-	-	2/1	4/2	8/1	2/1	-	24/3	1/1	12/3	2/1	-	-	-	-	-	-	-
Wildcat ( <i>Felis libyca</i> )	-	-	1/1	-	1/1	1/1	-	1/1	1/1	-	2/1	-	2/1	-	3/1	2/1	3/1	-	-	-	-	-	-
Caracal ( <i>Felis caracal</i> )	-	-	1/1	1/1	-	-	-	8/2	-	1/1	1/1	-	11/1	1/1	12/1	2/1	-	1/1	-	-	-	1/1	-
Leopard ( <i>Panthera pardus</i> )	-	-	1/1	-	-	-	-	2/1	2/1	-	2/1	-	15/1	1/1	5/1	-	-	1/1	-	-	-	-	-
Aarvark ( <i>Orycteropus afer</i> )	-	-	1/1	1/1	-	-	-	1/1	-	2/1	1/1	-	8/1	2/1	1/1	1/1	4/1	3/1	-	-	-	-	-

**Table 1.** Number of Identifiable Specimens (NISPY/ Minimum Number of Individuals (MNI) of mammals and tortoises at Elands Bay Cave. Total NISP for tortoises are not available and MNIs are based on humeri. Observations updated since Klein & Cruz-Urbe (1987) (Klein pers. comm., 2009) (continuation).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Rock hyrax ( <i>Procapra capensis</i> )	6/6	8/2	18/2	36/4	3/1	15/4	7/1	29/2	19/2	42/3	2/1	2/1	179/12	13/1	97/7	5/3	2/5	12/2	8/1	1/1	-	-	-
Elephant ( <i>Loxodonta africana</i> )	-	-	1/1	-	-	-	-	-	-	1/1	-	-	1/1	-	2/1	1/1	1/1	-	-	-	-	-	-
Quagga ( <i>Equus quagga</i> )	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	2/1	3/1	1/1	5/1	1/1	1/1	1/1	-	-
Hed -Cape zebra* ( <i>Equus capensis</i> )	-	-	-	-	-	-	-	2/1	-	1/1	1/1	-	4/1	-	36/2	29/1	5/1	6/1	2/1	2/1	1/1	-	-
Equid - all	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34/2	22/1	4/1	-	-	-	-	-	-
Black rhinoceros ( <i>Diceros bicornis</i> )	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	1/1	5/1	-	-	-	-	-	-
Rhinocerotid - all	-	-	-	-	-	-	-	-	-	1/1	1/1	-	2/1	-	1/1	6/1	6/1	2/1	4/1	-	-	-	-
Hippopotamus ( <i>Hippopotamus amphibius</i> )	-	-	-	1/1	-	-	-	1/1	1/1	-	-	-	2/1	-	18/2	3/2	-	-	-	-	-	-	-
Bushpig ( <i>Potamochoerus porcus</i> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	-	-	-	-
Suid - all	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	3/1	1/1	-	1/1	-	-	-	-	-
Eland ( <i>Taurotragus oryx</i> )	-	-	-	1/1	-	-	-	2/1	-	2/1	3/1	-	13/4	3/1	43/8	35/4	7/2	5/2	1/1	-	-	-	-
Blue antelope ( <i>Hippotragus leucophaeus</i> )	-	-	-	-	-	-	-	1/1	-	1/1	-	-	-	-	2/1	2/1	-	-	-	-	-	-	-
Southern reedbuck ( <i>Redunca arundinum</i> )	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	-	-	-	1/1	-	-	-	-
Cape hartebeest ( <i>Alcelaphus busseolaphus</i> )	1/1	-	-	5/2	-	-	-	2/1	-	-	1/1	-	3/1	-	12/2	2/1	-	3/1	-	-	-	-	-
Springbok ( <i>Antidorcas marsupialis</i> )	-	-	-	-	-	-	-	-	-	-	1/1	-	-	-	-	-	-	-	-	-	-	-	-

**Table 1.** Number of Identifiable Specimens (NISP)/ Minimum Number of Individuals (MNI) of mammals and tortoises at Elands Bay Cave. Total NISP for tortoises are not available and MNIs are based on humeri. Observations updated since Klein & Cruz-Urbe (1987) (Klein pers. comm., 2009) (continuation).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Gray duiker ( <i>Sylvicapra grimmia</i> )	1/1	-	1/1	14/3	3/1	1/1	-	1/1	5/1	6/1	3/2	1/1	15/3	3/1	36/3	8/2	2/1	-	-	-	-	-	-
Klipspringer ( <i>Oreotragus oreotragus</i> )	-	-	-	-	-	-	-	-	-	1/1	-	1/1	-	-	3/1	-	-	2/1	-	-	-	-	-
Steenbok ( <i>Raphicerus campestris</i> )	1/1	-	-	11/3	4/1	3/2	-	2/2	-	4/2	4/3	7/1	25/8	1/1	5/4	3/1	-	-	-	-	-	-	-
Gnysbok ( <i>Raphicerus melanotis</i> )	-	1/1	1/1	1/1	-	1/1	-	1/1	3/2	7/3	5/2	-	15/5	2/1	21/6	8/3	-	-	-	-	-	-	-
Steenbok/gnysbok ( <i>Raphicerus</i> spp.)	5/1	5/1	27/4	59/11	14/2	25/5	3/1	24/5	19/3	86/1	31/6	22/5	255/27	1/3	248/23	89/1	28/3	7/1	-	2/1	-	-	-
Sheep ( <i>Ovis aries</i> )	1/1	-	2/1	9/2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffalo(s)/cattle (Bovini gen. et sp. indet.)	1/1	-	-	-	-	-	-	1/1	-	-	-	-	8/3	1/1	7/1	9/2	1/1	1/1	1/1	-	-	-	-
Small bovid - all	26/2	25/1	116/6	316/11	71/3	165/6	31/2	18/7	27/8	378/1	228/22	86/5	1673/32	86/3	868/23	48/11	222/6	146/6	31/2	6/1	7/2	3/1	-
Small-medium bovid - all	11/1	5/1	31/2	96/4	11/1	8/1	2/1	1/1	19/2	19/1	14/2	1/1	36/3	6/1	72/3	35/2	5/1	6/1	-	2/1	-	-	-
Large-medium bovid - all	2/1	1/1	4/1	37/2	-	9/1	-	7/1	3/1	6/1	9/1	-	22/2	11/1	52/3	23/1	7/1	23/2	3/1	-	1/1	2/1	-
Large bovid - all	1/1	-	3/1	5/1	1/3	1/1	-	1/1	1/1	13/1	23/1	-	64/4	9/1	157/9	17/4	22/2	21/2	7/1	1/1	1/1	-	-
Tortoises ( <i>Chersinia angulata</i> )	1	5	27	3	6	20	5	37	31	143	130	12	638	56	1034	449	132	72	70	4	4	4	1

its to EBC but also longer residential permanence (see Jerardino, 1995a for a methodological approach). The lack of a seasonal signature for pre-9000 BP seal bone assemblages also gives support to relatively frequent and/or longer visits to EBC (Woodborne *et al.*, 1995). The presence of relatively large quantities of ochre between 11 000 and 8000 years ago suggests the possibility of intensified ritual activities around this time. Furthermore, longer visits not only would have increased the number of activities undertaken and raised the chances of losing items of personal ornamentation at EBC, they would also have seen the death of some of the members of visiting groups: three out of six human burials recorded for EBC date to between 11 000 and 8000 years ago (Morris, 1992). Hence, larger social groups involving a fuller range of domestic activities and intensified ritual are likely to explain the richness and diversity of the assemblages dating to between 11 000 and 8500 BP (Parkington, 1981, 1988, 1990).

Mobility appears to have involved long journeys to the interior of South Africa, as reflected by relatively higher frequencies of lithic raw materials not available locally, such as metamorphosed shale, *hornfels*, black chert, cryptocrystalline silica and other rocks of igneous origin (Orton, 2006; Parkington, 1990). Around 11 000 BP, such long-distance rounds may have also included visits to Faraoskop, situated 30 km inland from present Lamberts Bay, as suggested by the relatively higher frequencies of these types of lithic raw materials at that time (Manhire, 1993). Moreover, although it is difficult to prove at this stage, it is likely that mobility rounds and overall settlement pattern would have included sites and locations now submerged under the Atlantic Ocean (Parkington, 1990).

## Subsistence and diet

The faunal sequences of EBC, Tortoise Cave (TC) and Steenbokfontein Cave (SBF) are central to the reconstruction of the exploitation of mammals and tortoises between 20000 and 4300 BP (tables 1-3). These assemblages reflect changes in prehistoric human ecology for much of the terminal Pleistocene and early Holocene and related re-configuration of subsistence strategies during the mid-Holocene. Changes in mammal species frequencies document both the late glacial rise in sea level and climatic/vegetational change across the Last Glacial/Present Interglacial (Holocene) boundary. The extinction of Cape zebra (*Equus capensis*) and possibly the giant buffalo (*Pelorovis antiquus*) is probably related to these climatic shifts. However, it is likely that more effective LSA hunting practices by more numerous LSA groups were also partly responsible for their disappearance from the local archaeological record, as both species survived comparable changes during the transition from the Penultimate Glaciation to the Last Interglacial roughly 130,000 years ago. A sudden jump in the abundance of seal bones about 9600 is accompanied by a sharp increase in marine shells and in bones of fish and shore birds, surely reflecting the late glacial rise in sea level bringing the coast well within the foraging range of EBC occupants.



**Table 2.** NISP/ MNI of mammals and tortoises at Tortoise Cave. Total NISP for tortoises are not available and MNIs are based on humeri. Layers 9 and 12 do not exist after revision of Tortoise Cave stratigraphy and additional radiocarbon dates (Jerardino 1995*b*). Observations updated since Klein & Cruz-Urbe (1987) (Klein, pers. comm., 2009).

Linnaean Names	1A	1B	2A	2B	3A	3B	5	6	7	8	10	11	13A	13B	14
Vernacular Names															
<i>Ethiacaes frontalis</i>	-	-	-	-	-	-	-	-	-	-	-	-	2/1	-	-
Hedgehog															
<i>Leporida</i>	29/3	2/1	26/2	16/2	12/1	-	2/1	2/1	1/1	-	16/2	4/2	6/1	-	2/1
Hare															
<i>Bathyergus suillus</i>	166/12	26/2	107/9	67/5	20/2	24/3	8/1	15/2	12/2	13/4	365/23	98/9	92/7	20/2	22/3
Cape dune mole rat															
<i>Hystrix africaeaustralis</i>	1/1	1/1	-	-	1/1	1/1	-	-	-	-	-	-	-	-	-
Cape porcupine															
<i>Papio ursinus</i>	-	-	1/1	-	-	-	-	-	-	-	-	-	-	-	-
Baboon															
<i>Canis mesomelas</i>	-	-	-	-	1/1	-	-	-	-	-	-	2/1	-	-	-
Black-backed jackal															
<i>Ichonyx striatus</i>	1/1	-	1/1	1/1	1/1	-	-	-	-	-	-	1/1	-	2/1	-
Striped polecat															
<i>Mellivora capensis</i>	-	-	-	-	-	1/1	-	-	-	-	-	-	-	-	-
Honey badger															
<i>Galerella pulverulenta</i>	11/2	-	4/2	8/1	-	2/1	3/1	1/1	2/1	-	4/1	-	3/1	-	-
Small grey mongoose															
<i>Felis lybica</i>	-	-	1/1	-	-	1/1	-	-	-	-	-	-	-	-	-
Wild cat															
<i>Felis caracal</i>	-	-	-	-	-	-	-	-	-	-	1/1	1/1	-	-	-
Caracal (large wild cat)															
<i>Sus scrofa</i>	1/1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-indigenous pig															
<i>Orycteropus afer</i>	-	-	-	-	-	-	-	-	-	-	-	1/1	1/1	-	-
Aardvark															
<i>Arctocephalius pusillus</i>	18/2	4/1	57/2	35/2	41/2	20/1	-	1/1	-	-	40/1	9/3	21/2	4/1	4/1
Cape fur seal															
<i>Procavia capensis</i>	92/8	19/2	59/10	27/2	12/2	12/1	3/1	5/1	3/2	2/1	28/2	8/3	13/2	8/2	5/1
Rock hyrax															
<i>Sylviscapra grimmia</i>	-	-	1/1	-	-	-	-	-	1/1	-	-	1/1	2/1	-	-
Grey duiker															
<i>Raphicerus campestris</i>	4/2	1/1	11/5	9/6	2/1	2/2	-	-	-	-	1/1	2/2	2/2	-	-
Steenbok															
<i>Raphicerus melanotis</i>	1/1	-	-	1/1	-	1/1	-	-	-	-	-	2/2	-	-	-
Grysbok															
<i>Raphicerus ssp.</i>	90/4	38/4	132/9	115/7	122/4	146/6	31/2	60/2	32/3	15/1	234/5	122/5	134/4	6/1	8/1
Steenbok/ grysbok															
<i>Ovis aries</i>	14/2	1/1	28/6	13/3	9/1	-	1/1	-	-	-	-	-	-	-	-
Sheep															
<i>Rhinocerotid</i>	1/1	1/1	5/1	2/1	-	-	-	-	-	-	-	-	-	-	-
Rhinocerotid															
<i>Taurotragus oryx</i>	3/2	1/1	1/1	1/1	-	-	-	-	-	-	-	-	1/1	-	-
Eland															
<i>Syncerus caffer</i>	-	-	-	-	-	2/1	-	-	-	-	-	-	-	-	-
Cape buffalo															
Small bovid	90/4	38/4	132/9	115/7	122/4	146/6	31/2	60/2	32/3	15/1	234/5	122/5	134/4	37/2	44/2
Small-medium bovid															
Large-medium bovid	1/1	1/1	-	-	-	1/1	-	1/1	-	-	-	-	-	-	-
Large-medium bovid															
Large bovid	3/2	2/1	2/1	2/1	1/1	4/1	-	3/1	-	-	1/1	7/2	7/1	2/1	2/1
Angular tortoise	x/25	x/4	x/11	x/11	x/6	x/6	x/1	x/4	x/2	x/1	x/25	x/8	x/13	x/6	x/4

**Table 3.** NISP/ MNI of mammals and tortoises at Steenbokfontein Cave. Observations updated since Jerardino & Yates (1996) (Klein, pers. comm., 2009). Total NISP for tortoises are not available and MNIs are based on humeri and femora.

Linnaean Names	Vernacular Names	2200 BP	2400 BP	2500 BP	2700 BP	3500 BP	4000 BP	4600-8400 BP
		1	2	3A	3B	4A	4B	5
<i>Lepus</i> spp.	Hares	3/1	1/1	-	9/1	3/1	22/2	6/2
<i>Bathyergus suillus</i>	Cape dune mole rat	13/2	8/1	-	12/2	2/2	22/3	11/1
<i>Hystrix africaeaustralis</i>	Porcupine	-	-	-	-	-	1/1	1/1
<i>Canis mesomelas</i>	Black-backed jackal	2/1	-	3/2	-	-	1/1	1/1
<i>Ictonyx striatus</i>	Striped polecat	-	-	-	-	-	1/1	1/1
<i>Herpestes pulverulentus</i>	Gray mongoose	-	-	-	-	4/2	4/1	-
<i>Herpestes ichheumon</i>	Egyptian mongoose	-	-	-	-	-	1/1	-
	Indet. small viverrid	1/1	-	-	-	-	-	-
<i>Felis libyca</i>	Wildcat	-	-	-	2/1	5/1	4/1	4/1
<i>Felis caracal aut serval</i>	Caracal or serval	-	-	4/1	-	-	1/1	-
<i>Arctocephalus pusillus</i>	Cape fur seal	52/3	1/1	2/1	19/2	12/1	40/3	17/2
<i>Procavia capensis</i>	Rock hyrax	15/2	2/1	4/2	6/1	20/4	47/4	19/2
<i>Orycteropus afer</i>	Aardvark	-	-	-	-	-	4/1	-
<i>Raphicerus campestris</i>	Steenbok	11/2	8/2	8/3	23/4	58/8	75/9	27/4
<i>Sylvicapra grimmia</i>	Gray duiker	5/3	1/1	5/2	4/1	6/2	2/1	1/1
<i>Ovis aries</i>	Sheep	1/1	1/1	-	-	-	-	-
	Small bovid(s)	148/4	46/4	101/6	215/5	699/20	903/29	284/8
	Small-medium bovid(s)	21/3	3/1	12/2	13/1	34/2	25/3	3/1
	Large-medium bovid(s)	2/1	-	4/1	1/1	2/1	5/1	2/1
	Large bovid(s)	1/1	-	-	3/1	17/1	41/2	3/1
<i>Chersina angulata</i>	Angular tortoise	x/18	x/20	x/6	x/28	x/53	x/48	x/23

Between 20 000 and 10 000 BP, forager groups were probably few, small and sparsely distributed in the landscape and seem to have relied on large mobile game to a noticeable extent, although hunting of smaller and territorial antelopes as well as foraging tortoises and shellfish made a fair contribution to their food-base (table 1). As initially suggested by H.J. Deacon (1976) for the eastern Cape, hunting of larger migratory antelope is frequently linked with large-group organization, low population density and large territories. Cross-cultural ethnographic data and theoretical arguments suggest indeed a strong relationship between the relative dependence on hunting and the total area exploited, although mobile hunter-gatherer group size would have had on average an upper limit of about twenty-five people (Kelly, 1995). Plant food is very likely to have been also col-

**Table 4.** Densities (g/m<sup>3</sup>) of marine and terrestrial food remains and density ratios for marine/terrestrial faunal remains and for tortoise/mammal remains. Seal bones are not included here as density observations are not available. Bird remains include marine and terrestrial species and have yet to be analyzed for SBF, and therefore also not included here.

<b>Pancho's Kitchen Midden</b>												<b>Densities [g/m<sup>3</sup>]</b>		<b>Density Ratios</b>		<b>NISP Large &amp; medium bovid index</b>	
<b>Age (yrs BP)</b>	<b>Strata</b>	<b>Shell</b>	<b>Fish</b>	<b>Marine Fauna</b>	<b>Mammal</b>	<b>Tortoise</b>	<b>OES</b>	<b>Terrestrial Fauna</b>	<b>Marine/Terrestrial</b>	<b>Tortoise/Mammal</b>	<b>Tortoise/Mammal</b>	$\Sigma$ large+medium/	$\Sigma$ large+medium+small	$\Sigma$ large+medium/	$\Sigma$ large+medium+small		
post 2000	Layers 1+2	442000.0	5.9	442005.9	1079.0	2821.0	149.5	4049.5	109.2	2.6	2.6	0.434					
c. 2650	Layer 3	468000.0	11.7	468011.7	136.5	565.5	5.9	707.9	661.1	4.1	4.1	0.100					
c. 2900 - 3100	Layers 4-6	426833.0	125.5	426958.5	481.0	1488.5	5.9	1975.4	216.1	3.1	3.1	0.151					
c. 3600	Layer 7	305500.0	11.0	305511.0	591.5	1118.0	3.9	1713.4	178.3	1.9	1.9	0.130					
<b>Steenbokfontein Cave</b>												<b>Densities [g/m<sup>3</sup>]</b>		<b>Density Ratios</b>		<b>medium bovid index</b>	
<b>Age (yrs BP)</b>	<b>Strata</b>	<b>Shell</b>	<b>Fish</b>	<b>Marine Fauna</b>	<b>Mammal</b>	<b>Tortoise</b>	<b>OES</b>	<b>Terrestrial Fauna</b>	<b>Marine/Terrestrial</b>	<b>Tortoise/Mammal</b>	<b>Tortoise/Mammal</b>	$\Sigma$ large+medium/	$\Sigma$ large+medium+small	$\Sigma$ large+medium/	$\Sigma$ large+medium+small		
c. 2200	Layer 1	186875.0	27.9	186902.9	1449.5	5193.5	97.5	6740.5	27.7	3.6	3.6	0.017					
c. 2400	Layer 2	128992.5	14.3	129006.8	611.0	2749.5	65.0	3425.5	37.6	4.5	4.5	0					
c. 2700-2500	Layer 3a+b	166361.0	12.2	166373.2	914.9	4172.3	108.7	5195.9	32.0	4.5	4.5	0.023					
c. 3650-3500	Layer 4a	348478.0	32.5	348510.5	4790.5	8177.0	91.0	13058.5	26.7	1.7	1.7	0.025					
c. 4000	Layer 4b	186043.0	76.1	186119.1	3009.5	4166.5	52.0	7228.0	25.7	1.4	1.4	0.047					

lected at this time, but little evidence of it is preserved in EBC. Wads of eelgrass *Zostera capensis* collected for bedding are preserved in EBC levels dating to between 11 000 and 8000 years ago and soon after 4300 BP, while abundant remains of edible plant species are found mostly in deposits dating to the last two millennia, a pattern that has led to suggest that a behavioural explanation behind it (Parkington, 1990). Nevertheless, *Z. capensis* is adapted to estuarine conditions and the survival of its tissue over many millennia when compared to terrestrial plant remains might well reflect differential preservation given its hardness to withstand salt and acidity levels to which terrestrial plants are never exposed. Moreover, highest densities of shellfish and tortoise bones between 12 000 and 8500 BP, both evidently non-plant foods, are likely to have been the outcome of women foraging near EBC (Parkington, 1990). Hence, group composition is unlikely to account for the near absence of plant food remains during the Terminal Pleistocene and early Holocene, and preservation biases are a more likely explanation.

As could be expected with a rapid late glacial sea level rise, successive re-configurations of the shoreline and changing emphasis on marine resources seem to have shaped the species abundances and sizes of the most frequently collected molluscs at EBC (Parkington, 2008; A.J. personal observation). The first appearance of shellfish at EBC around 11 000 years ago is entirely dominated by large intertidal limpets (*Cymbula granatina* and *Scutellastra granularis*). Modest contributions are made soon after by relatively small and thin-shelled black mussels (*Choromytilus meridionalis*) (~ 9 %) and a few whelks (*Burnnupena* spp and *Nucella* spp) (< 1 %) by about 10 500 BP. Shellfish species composition changed even more around 10 000-9800 BP when greater numbers of small-sized black mussels (~ 65 %) and noticeable contributions of whelks (~ 10 %) were brought back to EBC. Average limpet and black mussel sizes seem to have shrunk dramatically (Parkington, 2008), reaching sizes similar and slightly smaller than those recorded during the late Holocene when molluscs and other marine resources were heavily exploited and impacted upon in the Lamberts Bay area (Jerardino *et al.*, 2008). As subsistence became increasingly focused on marine resources and visits became more frequent and longer at this time, it is likely that early Holocene foragers might have also exerted considerable pressure on black mussel colonies and two of the most common intertidal limpets. These preliminary observations need to be confirmed with further metrical data as differential preservation and usage of more than one mesh size for field screening may have biased limpet size values (Jerardino & Navarro, 2008). Although EBC continued to be occupied regularly and for longer periods around 9500 BP, mussel and limpet sizes show signs of recovery and right at a time when fish, seals, marine birds, tortoises and mammals are brought back to the cave in very large quantities (Parkington, n.d). Black mussels continued to dominate shellfish collections thereafter, followed by fluctuating quantities of limpets and whelks.

In a changing post-glacial environment, highly mobile bands of probably no more than 25 individuals and displaying an overall low-population density would have needed to rely on aggregation phases for meeting some of their most important social needs: maintaining and reinforcing social networks which could potentially secure access to subsistence resources

during lean times, assert group identity and seeking partners through marriage brokering, among others. The many group activities that fulfil and support these social imperatives are often framed in a ritualized context (Marshall, 1976; Silberbauer, 1981; Wadley, 1978). The choice of a location for aggregation phases would have needed to meet several criteria, not the least being the size of the place that would have hosted a relatively large number of people. Aside of short visits to Faraoskop between 16 500 and 11 000 BP, and possibly SBF, EBC position close to the sea and access to predictable marine resources and also at short distance from Verlorenvlei and its estuarine and lagoonal environments offered almost ideal conditions for the aggregation of several bands. As shown by extensive cross-cultural ethnographic surveys, coastal environments allow for longer residential permanence when compared to purely terrestrial environments (Erlandson, 2001; Kelly, 1995; Perlman, 1980). The choice of settlement at EBC and use of a variety of marine resources between about 11 000 and 8000 years ago allowed bands to aggregate for extended periods of time and fulfil their social needs. Strong reliance on marine resources is evident as shown by shrinking sizes of limpets and black mussels soon after 10 000 BP and highest levels of fish and seal procurement in EBC sequence by about 9500 BP. In the hypothetical absence of EBC, or possible changes in the preference of a suitable place for large gatherings, it is likely that other coastal sites would have fulfilled the role that EBC played during the Pleistocene/Holocene transition, with their most fundamental advantage being the predictability, reliability and relatively high productivity of marine resources along this particular coastline and the complement that they presented to terrestrial resources.

## Late Holocene resource intensification and high population densities

### Settlement patterns

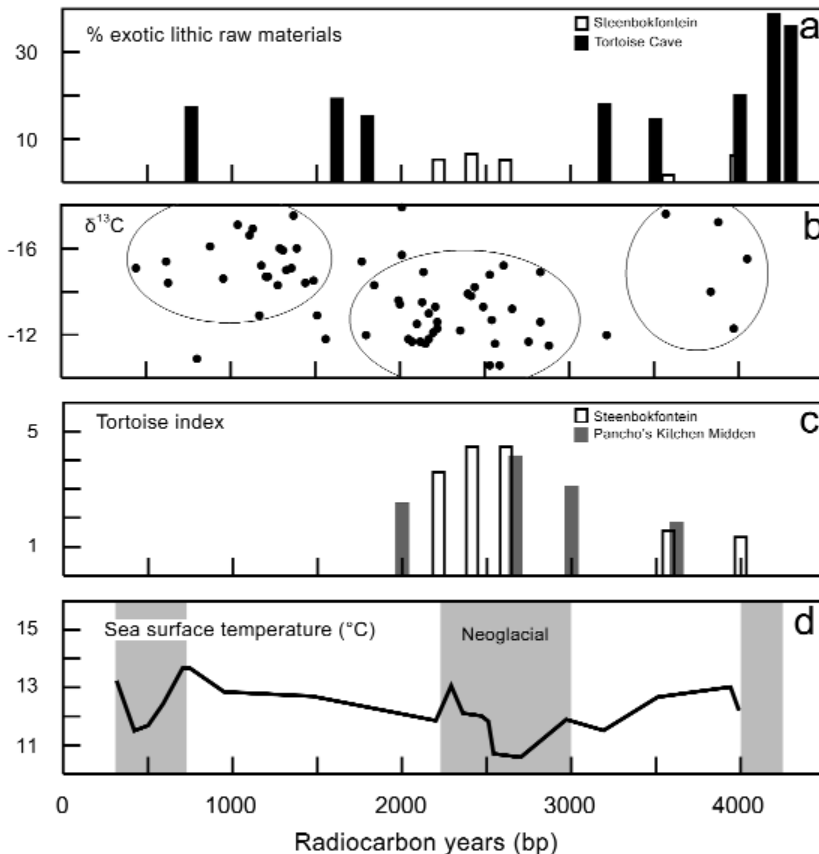
Visits in the Elands Bay and Lamberts Bay areas between 4,400 and 3,000 years ago took place mostly in cave and small shelters (fig. 4: cave and semi-open), with volumes of accumulated deposit in the order of 1 to 10 m<sup>3</sup>. Within this period, by about 3500 BP, at least three sites (Spring Cave [SC], Pancho's Kitchen Midden [PKM] and Scorpion Shelter [SS]) were occupied for the first time (fig. 4). Moreover, at Tortoise Cave (TC), between 4,000 and 3,200 years ago, overall rates of deposition increased substantially (fig. 4), occupational floor areas were of one order of magnitude bigger than before, and many more finished and unfinished items of personal ornamentation were lost during this time than earlier, reflecting larger groups and longer visits to this site (Jerardino, 1995a, 1996). Volumes of deposits at TC range between 10 and 100 m<sup>3</sup> per site at this time (fig. 4). Together with the initial occupations of SC, PKM and SS, these trends are taken as a likely reflection of population increase and longer residential permanence of forager groups. Mobility rounds

involved also shorter distances after 4000 BP: frequencies of exotic lithic raw materials from SBF, TC and SS (3-21 %) between 4000 and 3200 BP are smaller than those recorded from older (4400-4200 BP) levels at TC (29-38 %) and deflation hollows (37 %) (Jerardino, 1996; Manhire, 1987). Although the incidence of exotic raw materials in mid-Holocene levels (6000-4600 BP) at SBF (9.7 %) is smaller than that reflected in immediately younger TC levels and deflation hollows, these are nonetheless higher than those post dating 4000 BP at the same site.

Subsequently, between 3000 and 2000 BP, settlement changed radically to become concentrated mostly immediately behind rocky points, leading to the formation of very large open shell middens (fig. 4). Tons of marine shell and low densities of artefacts and terrestrial fauna characterize these enormous shell middens (Buchanan, 1988; Jerardino & Yates, 1997; Parkington *et al.*, 1988). Due to their massive size, the term «megamidden» was coined for these sites when first described more than 30 years ago (Parkington, 1976). Similar-sized shell middens of comparable age (the same millennium) have also been reported further south on the Vredenburg Peninsula (Smith, 2006: 56-57; Yates, 2004). Volumes of deposit for these sites range from a hundred to several thousand cubic meters per site (fig. 4).

The amount of archaeological material that built up during the megamidden period is unparalleled and is not seen on the southern African coastal landscape during any other period. These very large sites were initially described as very poor in faunal and cultural remains and rich in charcoal contents (Buchanan, 1988; Parkington, 1976, Parkington *et al.*, 1988). Leaning on experimental studies, Henshilwood *et al.* (1994) argued that megamidens represented localities for shellfish drying and processing, and that these large sites formed part of logistical movements from interior mountain sites to where dry shellfish would have been transported for final consumption. Although an attractive idea, the dearth of radiocarbon dates from hinterland sites falling between 3000 and 2000 BP (Jerardino, 1996: 87) did not support this scenario. Moreover, conservative estimates of total weight of vertebrate remains and numbers of flaked stone artefacts from megamidens are of the same order of magnitude, and at times greater than, those of cave sites, such as SBF and TC, covering over 1,000 years of site occupation (Jerardino, 1996; Jerardino & Yates, 1997: 50). Evidently, the sheer quantities of marine shell present at megamidens have biased the perception of these sites as depleted of faunal and cultural remains. Significantly more bone and flaked stone artefacts were accumulated at these large sites than during contemporary occupation of caves and rock shelters within a two kilometre range from the shore. Careful examination of evidence from Mike Taylor's Midden (MTM) and other megamidens (fig. 3) suggests a more varied functionality of these large sites: not only large-scale shellfish drying seems to have taken place at megamidens, but also stone knapping and processing of animal foods (Jerardino, in press; Jerardino & Yates 1997).

Dating of sites has shown that only two contemporary caves and shelters were occupied during the «megamidden period», namely SBF and PKM (figs. 2 & 3). A few small open-air sites south of MTM were also occupied at the end of this period (Jerardino, 2003). Exotic raw materials were rarely used at SBF (6-8 %) and PKM during this millennium



**Fig. 5.** Summary trends of a) forager mobility based on relative abundances of lithic raw materials; b) dietary reconstructions based on isotope measurements on skeletal material (more positive values reflect more marine intake); c) terrestrial meat procurement as expressed by the tortoise/mammal index (see table 4); and d) late Holocene palaeoenvironmental record in the study area showing changes in sea surface temperatures and timing of Neoglacial episodes (uncalibrated radiocarbon years BP).

(1-6 %) (fig. 5a; Jerardino, 1998), suggesting mobility circumscription to the coastal plain at this time. The overall scenario suggests that as population levels increased and visits were extended between 4,000 and 3,200 years ago, mobility became increasingly restricted to the coastal margin. This trend appears to have reached its maximum expression during the following millennium between 3,000 and 2,000 years ago. Settlement at or near megamiddens appears to have become semi-sedentary, and contact with inland areas, where *hornfels* and other types of shales are available, as well as visits beyond the Oliphant River to the north and Berg River to the south, where silcrete outcrops are accessible, were probably very rare.

An increase in population densities during this period is also supported by the human skeletal record from the western Cape coast dating to the last 6,000 years (Sealy & Van

der Merwe, 1988; Lee-Thorp, *et al.* 1989). Of the total number of skeletons found between Lamberts Bay and Cape Point, nearly 40 % date to between 3000 and 2000 BP (fig. 5b). Recent physical anthropological studies have also shown that men and women from the western Cape region were experiencing growth stunting to a significant degree during the megamidden period, probably as a result of dietary stress (Pfeiffer, 2010; Pfeiffer & Sealy, 2006). Cases for growth stunting during this millennium extend to the southern Cape coastal regions and also overlap temporally with higher incidences of forager interpersonal violence in both regions, as indicated by fatal cranial trauma (Pfeiffer, 2010; Pfeiffer & Van der Merwe, 2004; Pfeiffer *et al.*, 1999).

The concept of a suitable place for habitation during the megamidden period was probably radically different to that before and after. Only a fraction of all cave sites and shelters available for occupation were used despite clear signs of more people filling the landscape. SBF 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, leaving behind numerous hearth features, high densities of finished and unfinished OES beads and other items of personal ornamentation, plus ochre and ochre-stained artefacts and rocks (Jerardino, 1996; Jerardino & Yates, 1996). 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 SBF was occupied repeatedly for purposes of aggregation during these few centuries, a pattern that may well have been in place already by about 3600 BP (Jerardino, 1996). Ritual mediation of stress and conflict may have taken place in the context of long lasting and communal trance dances and healing rituals, as observed in similar situations of social stress among San groups (Guenther, 1975, 1975/1976). Story telling, youths' initiation, marriage brokering, and exchange of gifts and information are usually an integral part of the intense social life surrounding these types of gatherings (Marshall, 1976; Lee, 1979; Silberbauer, 1981). Exchanging presents within a social context akin to the *hxaro* system of gift exchange observed among some Kalahari San groups (Wiessner, 1984), and proposed by Wadley (1988) to have had considerable time depth in southern Africa, was probably developed as a means of smoothing over tension brought about by rising population levels and dietary stress and, perhaps also, for gaining access to resources and goods from more productive areas (see below).

After 2500 BP, either SBF ceased to be a focus of communal gatherings, with aggregation phases taking place elsewhere, or such events became less frequent altogether. The large and south-east facing cave located in the same outcrop as SBF could have offered the right conditions for such gatherings, but no archaeological investigations have been conducted there yet. Alternatively, EBC might have become a new focus of aggregation considering that there is evidence for occupation at this site about 2200 BP (fig. 4). It is also possible that ritual might have no longer been able to dissipate the high levels of social and dietary stress after 2500 BP. Under these circumstances, people would have been left with fewer options for resolving and coping with stress and conflict. Foragers may have moved



to the periphery of the study area, and/or withdrawn to smaller pockets of the landscape where groups could have exercised exclusive rights or ownership. This possibility seems to be partly reflected in the relatively intense occupation of MTM after 2500 BP and several dune cordon sites south of MTM (fig. 3), all of which are situated to the south of the Elands Bay area (Jerardino, 2003; Jerardino & Yates 1997). Population dispersal to the north of SBF is still to be tested with more intensive surveys. It is thus likely that the reformulation of stress-coping mechanisms towards the end of the megamidden period might have witnessed the dislocation of previous social networks among coastal forager groups.

## Subsistence and diet

Earlier work on stable Carbon isotope analyses (Sealy & Van der Merwe, 1988; Lee-Thorp *et al.*, 1989) (fig. 5b) established that an increase in marine food intake characterized forager diet during the megamidden period. Much of the protein and a significant portion of energy-rich foodstuffs were obtained from marine resources during this millennium. In contrast, the last 2,000 years saw a greater contribution of terrestrial proteins and carbohydrates into people's diets. Density ratios of terrestrial and marine dietary remains calculated for SBF and PKM sequences also show an increase in marine foodstuffs from about 4000-3500 BP, and particularly around 2,600 and 2,500 years ago (table 4). Thus, both archaeological and isotopic evidence are in agreement, suggesting that forager diet during the megamidden period was more marine than ever before or after.

Insight into the subsistence strategy employed in the exploitation of terrestrial resources during the megamidden period can also be gained by establishing simple indices reflecting the acquisition of tortoises relative to all other terrestrial vertebrates (mammals) based on weight densities (Density tortoises/ Density other terrestrial vertebrates), and by also calculating an index of large prey (large and medium bovids) usage (after Broughton 1994a, 1994b) on the basis of Number of Identified Specimens ( NISP large + medium bovids/ NISP small + small-medium bovids; table 4). Relative abundance indices are known to be influenced by sampling size effects (Grayson, 1984), but the observed changes in these cases are not likely to be driven by sample size effects as revealed by Spearman correlation tests (see Jerardino, in press).

For the purpose of the assemblages discussed here, small bovids include steenbok and/or grysbok (*Raphicerus* spp); small-medium bovids consist of grey duiker (*Sylvicapra grimmia*) and domestic sheep (*Ovis aries*); and within the category of large bovids, the eland (*Taurotragus oryx*) and bovines such as *Bos taurus* are included. In earlier work, the grey duiker was classified as a small bovid (Klein, 1981), and given its small average mass weight of ~ 17 kg (males) and ~ 18 kg (females) when compared to that of an eland (~ 650 kg for males and ~ 400 kg for females) or springbok (*Antidorcas marsupialis*, not present in assemblages considered here) (~ 41 for males and ~ 37 for females), it can well be considered a small prey along with steenbok (~ 11 kg) and grysbok (~ 10 kg) (Skinner

& Smithers, 1990). The presence of sheep bones in the PKM assemblage pertains only to post-2000 BP material and results from incoming herder/ pastoralist economy around this time. The conceptual approach used implicitly in the generation of these indices is that of Optimal Foraging Theory, and given the scope of this chapter and limited printing space, the reader is advised to consult relevant sources for a background discussion on this model (Broughton, 1994a, 1994b; Grayson & Cannon, 1999; Kelly, 1995; Nagaoka, 2000; Winderhalder, 1980, 1981). However, the interpretation of these indices is straightforward as discussed below.

The density ratios of tortoise versus mammal vertebrate remains (tortoise index) calculated for SBF and PKM indicate that the collection of these small and slow-moving reptiles increased steadily from c. 4000 onwards, becoming markedly emphasized above that of mammals between about 2700 and 2200 BP (table 4). Preliminary reconstructions of tortoise size (based on the mediolateral diameter of distal humeri) from SBF show systematic and significant reductions in tortoise sizes between about 8,000 and 3,500 years ago, with small tortoise sizes characterizing SBF record from 3500 BP onwards (Jerardino, in press). Moreover, large prey indices for PKM and SBF (table 4) show decreasing values from c. 4000 to 3500 BP and lowest values between about 2700 and 2200 BP. Spatial variability is nonetheless apparent, as large prey indices for PKM are consistently larger by one order of magnitude than those for SBF (table 4). Keeping in mind the occupational hiatus between 3,000 and 2,000 years ago at EBC, a similar temporal pattern in faunal ratios is apparent at this site (table 1).

The overall trend in large prey indices suggests a decline in mammalian foraging efficiency during the megamidden period. Large prey indices are particularly small around 2600 and 2400 BP at a time when marine food intake is greatest, tortoise acquisition is most emphasized (fig. 5b, c, table 4), and when human impact on at least two mollusc species is most noticeable (Jerardino *et al.*, 2008). The marked increase in the use of marine aquatic resources and concomitant decrease in the procurement of hunted species conforms well to cross-cultural trends among forager groups (Kelly, 1995: 71-73).

Considering the behavioural and ecological differences between larger and smaller bovids, the procurement of terrestrial meat during the megamidden period was most likely through snaring/ trapping and/or chasing small and small-medium bovids (mostly *Raphicerus* spp and *Sylvicapra grimmia* to a lesser extent) along the paths and areas patrolled by these small territorial antelopes (Klein, 1981; Skinner & Smithers, 1990). An increase in the procurement of small bovids is consistent with observations among recent forager groups where snaring or trapping intensity increases as residential mobility decreases (Holliday, 1998). It is likely that much of the large bovid record is represented by eland, a species well adapted to a variety of habitats including arid conditions (Skinner & Smithers, 1990). As a mixed feeder, this species would have been able to survive well in the face of possible palaeoenvironmental deterioration, with numbers expected to swell with overall increases in the environment's carrying capacity brought about by higher precipitation. Contrary to expectations, large prey indices decline when cool and wetter neoglacial con-

ditions dominated along the West Coast between 3,000 and 2,000 years ago (fig. 5d; Jerardino, 1995b). Overall, these observations may indicate a progressive decrease in the encounter rate of large terrestrial mammals during the megamidden period despite favourable environmental conditions, hinting at the local depression of vertebrate preys as suggested also by the predominantly small tortoise sizes from SBF. The mollusc evidence also points in the same direction (Jerardino *et al.*, 2008).

In sum, major subsistence adjustments were experienced as population densities grew steadily between 3500 and 2000 BP: forager diet became increasingly reliant on marine resources; hunting of large mobile prey became less relevant to coastal groups, with terrestrial mammal meat obtained mainly through snaring small and small-medium bovids and the intensification of tortoise procurement. This record shows a progressive and ever increasing reliance on smaller prey items from both terrestrial and marine ecosystems. Megamiddens were both living sites and locations where shellfish processing took place, with both of these activities shifting spatially through time and defining their extensive boundaries as a result. This reconstruction is consistent with hunter-gatherer resource intensification models as described elsewhere (Ames, 1991, 1994; Basgall, 1987; Beaton, 1991; Bouey, 1986; Broughton, 1994a & b; Broughton *et al.*, 2007; Hall, 1990; Kennett, 2005; Mazel, 1989; Price & Brown, 1985; Stahl, 1993; Stiner *et al.*, 2000). As such, it is the first to be described for a coastal setting in southern Africa. As pointed out above, coping mechanisms that help to deal with resource stress and landscape infilling were not only limited to reformulating diet breadth and prey choice, but also the intensification of ritual during aggregation phases at SBF. Most importantly, and in terms of the issues pursued in this paper, marine resources allowed for the largest population densities (as derived from proxy measures) so far recorded along the west coast of South Africa during the Holocene and also for forager settlement to become semi-sedentary. Hunter-gatherers clearly targeted terrestrial resources initially as population densities started to rise, but switched with great momentum to marine species (particularly shellfish) when levels appear to have become critical. New subsistence and settlement opportunities were once again afforded by marine resources, this time by a narrow number of species contributing with a good source of protein, which must have been complemented by energy rich food stuffs of both marine and terrestrial origin (Lee-Thorp *et al.*, 1989).

## Final reflections

Much of the evidence for early shellfish gathering in southern South Africa is derived from occupational horizons accumulated during relatively high sea level stands (~ 110-120 ka and later), as sites contemporary with sea levels lower than present are now under water and may have been washed away as a result (but see Bailey, 2004). Those that have

survived in locations above MIS5e and present sea levels are frequently damaged by human activities and additional taphonomic processes often compromise their stratigraphic integrity. A few coastal MSA sites such as PP13B, Klasies River Mouth and Blombos Cave (fig. 2) are some exceptions where such disturbances are minimal and/o can be accounted for to a large extent. The geological context of some early coastal cave sites, particularly in the Mosel Bay area (fig. 2), renders them difficult to access and, as a result, to discovery. Such sites are either high above semi-vertical cliff faces or out of sight covered by semi-consolidated Pleistocene dunes (Marean *et al.*, in press). Along the west coast of South Africa, the latter is often the case, with mining or harbour development revealing the presence of such ancient sites (Avery *et al.*, 2008; Volman, 1978). Hence, visibility and presence of varying quantities or densities of mollusc shells and the remains of other marine resources in MSA sites seems to be strongly determined by sea-level change, local geology, and other taphonomic factors affecting preservation which become more severe as one goes further back in time. Pinnacle Point has the earliest visible evidence of shellfish gathering in the world so far dated and published. Nevertheless, given the constraints just mentioned, such findings may not necessarily reflect the absolute earliest preserved evidence for the use of marine resources as intensified research and field work along southern African shorelines may show in the future.

There is no doubt that Middle and Upper Pleistocene Neanderthals, and perhaps other hominins, were able to collect shellfish from both rocky and sandy shore environments (Erlandson, 2001; Stiner, 1994; Stringer *et al.*, 2008), but the quantities that they brought back to their campsites were very small (Klein and Steele, 2008; Stiner 1994: 182, 194, table 6.12). Moreover, other non-hominid species, such as baboons, sea otters, sea gulls and oyster catchers (among others) regularly, or on occasions, collect molluscs from both soft and hard substrates, respectively (Davidge, 1978; DeVore & Hall, 1965; Hockey & Bosman, 1988; Joordens *et al.*, 2009; Siegfried, 1977). Access to these resources would have been conditioned by lunar-driven tidal movements as much as these constrained human access to the same resources. It appears, then, that shellfish procurement (particularly from hard substrate) and the ability to respond to these regular (daily and monthly) tidal movements doesn't strictly require modern human cognitive capacities. If so, are there any important differences in the foraging strategy of marine resources (e.g., shellfish) employed by MSA modern humans and that used by Neanderthals and non-hominins?

The ability to collect shellfish systematically and leave evidence of this behaviour in the form of *relatively large, dense shell middens in association with faunal remains, artefacts and sometimes site features* is something that African early modern humans seem to have done for many thousands of years before others. Other agents (birds and mammals) can also generate localized middens containing mollusc shells (Erlandson & Moss, 2001; Joordens *et al.*, 2009). However, compared to MSA and LSA shell middens that resulted from systematic shellfish collection by *Homo sapiens* groups, the quantities and densities of mollusc shells in Neanderthal and non-hominid middens are small in most

cases, and the life span of the latter involve relatively short periods of time. Moreover, the difference seen in *Homo sapiens* since about 110 ka, and as argued here, does not rely on quantity of collected material and location of disposal alone. The ability to procure *Donax serra* mussels (clam) and other sandy bottom bivalves exhibiting similar burrowing capacities when disturbed requires more than the ability to harvest shellfish by non-hominin species and by Neanderthals who seem to have done so on a more casual or opportunistic basis. When does shellfish collecting becomes systematic, and when can we regard shell dumps as «dense» or «localized» enough to reflect «modern human behaviour»? Maybe pursuing these questions might in the end not lend the needed conceptual or analytical leverage leading to meaningful answers, and rather the analysis needs to turn onto the ecology of the species and associated foraging ecology and procurement strategies. Nevertheless, future research must engage with questions regarding what systematic and planned exploitation of shellfish is (as opposed to casual collecting of shellfish, and/or direct and almost unimpeded access to shellfish colonies) and whether or not this is an indication of behavioural modernity (Erlandson, 2001; Erlandson & Moss, 2001; Joordens *et al.*, 2009). Doing so will probably need the input of well designed actualistic studies, taphonomic analyses, careful quantification of MSA faunal and artefactual contents (weights, MNIs, NISPs, metrical analyses and volumetric observations among the most important), and similarly detailed analyses of LSA coastal shell middens where the agency behind them is undeniably the result of «modern human behaviour». Modern humans exited Africa 80-70 ka (Behar *et al.*, 2008; Forster, 2004), and the routes that would have been taken were probably several, among which the coast is likely to have been tried for at least some stretches. The ability (knowledge and skill) to systematically exploit a range of coastal environments is likely to have assisted *Homo sapiens sapiens* to migrate out of Africa successfully and to continue expanding into Europe and Asia and beyond.

From the available data, it is apparent that shellfish collection throughout PP13B occupation and Elands Bay Cave took place when the shoreline was within the 10 km mark and closer (Jerardino & Marean, in press; Fisher *et al.*, 2010). Analyses of densities of shellfish, lithics, fauna and other findings strongly suggest that proximity to the shore was a key factor for site occupation, with occupation intensity increasing as the coastline approached these sites with sea level rise (Marean, in press; Parkington, 1988). These observations derive from two different and changing ecological and environmental settings, which seem to suggest that, in general, coastlines act like magnets for human settlement and longer residence. Although this might make intuitive sense in the light of ethno-historical and other basic archaeological data (Binford, 1990; Erlandson, 2001; Kelly, 1995), the archaeological test via quantified means with other case studies will be able to provide greater time depth to this ethnographic pattern.

The late Holocene sequence at Elands Bay and Lamberts Bay is another confirmation of increased sedentism in the context of coastal occupation and increased reliance on marine resources, particularly shellfish. Resource intensification is often described as a

process whereby «...the total energy extracted per areal unit of land is increased at the expense on an overall decrease in foraging efficiency» (Broughton 1994b: 501). However, it is possible that efficiency might have been maintained, since predictability and reliability of the most harvested resource (shellfish) was very high and its search and processing costs were likely to have been relatively low (Waselkov 1987; Kennett 2005). Also, predictability and low search costs, hence low risk and reliability, characterize also the procurement of small territorial bovids and tortoises. Costs of maintaining and monitoring traps/ snares would have, however, increased as their procurement intensified. Whether subsistence patterns during the megamidden period can be explained with more detail in terms of an energy-maximization diet or a risk-minimization diet (Kelly, 1995), it appears that dietary stress was experienced during at least the first half of this millennium (Pfeiffer & Sealy, 2006). Hence, risk reduction may have played an important role in foraging decision-making between 3,000 and 2,000 years ago along parts of the west coast of South Africa. Dietary stress in the context of changing subsistence strategies, local depression of subsistence resources and high population levels may have been also a factor in observed interpersonal violence during this millennium (Pfeiffer, 2010).

The shoreline where megamidens occur is characterized by long sandy shores punctuated by a limited number of rocky reefs with shellfish colonies. This relative constraint on the exploitable shellfish biomass is likely to have played a role in their depression during the megamidden period (Jerardino *et al.*, 2008). The scale of the exploitation of marine resources during the megamidden period was enormous, and because of this, it is hard to imagine that it was not organized (Jerardino, 1996). Which groups had access to which shellfish beds growing on some of the limited number of reefs and when? If shellfish was dried for later consumption during late summer red-tide events or rough stormy winter days, people must have also organized activities related to shellfish processing, such as the collection of firewood for the generation of hot coals and the erection of possible storage facilities. Similar questions can be posed regarding other subsistence activities such as snaring and capture of small bovids, and the mediation of rising levels of dietary stress through ritual intensification. All of these concerns make reference to decision-making and those with the authority to exercise it. It is possible that local hunter-gatherer social structure might 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 as observed amongst American Northwest hunter-gatherer groups (Ames, 1991, 1994; Price & Brown, 1985). Rather, it is proposed that incipient leadership rôles were pivotal for resolving conflict and tension at an intra- and inter-group level in matters related primarily to subsistence strategies and possibly of other nature (Jerardino, 1996). Population growth and reduced mobility are important factors leading to resource intensification, and these cannot be separated from social variables (Keeley, 1988). Certainly, «...greater numbers of people create, not eliminate, problems» (Price & Brown, 1985: 10).

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 invasions and survived because of their relative «flexibility». On the other hand, 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 (see Smith, 1998). The «aseasonal» character (because of possible storage) of the coastal forager economy in the Elands Bay and Lamberts Bay areas was probably not far removed in concept from the aseasonal access to subsistence means through stock keeping. Important to remember at this point is that the end of the megamidden period coincides with some of the earliest evidence for a herding economy in southern Africa, whether by fully fledged pastoralists or foragers taking on this subsistence task. This apparent temporal coincidence appear to suggest that the adoption of stock and herding skills in parts of southern Africa might not have been as difficult as previously thought (Smith, 1998), a subject that needs to be explored further and in greater detail.

A case has been made here for marine resources, particularly shellfish, having played at times an important role in shaping evolutionary and/or cultural changes among foragers of southern Africa. The three examples presented here derive from restricted locations along the west and south coasts of South Africa. To some extent, this is the result of intense research agendas undertaken in these regions. Perhaps similar reconstructions might emerge elsewhere in southern Africa as more and well-designed research projects are continued or started anew to the north and east of the study areas discussed here. Good efforts have been undertaken along the coastal semi-desert of Namaqualand (Dewar, 2008) where high-mobility and an immediate return economy characterized forager settlement and subsistence for much of the Holocene. More intense use of the landscape during late Holocene Neoglacial wet spells is also apparent, which is perhaps to be expected from marginal environments such as Namaqualand. In this case, it appears that a more opportunistic use of marine resources complemented a diet based mainly on those of terrestrial origin. This seems to be echoed by extensive surveys at an open dune system north of Cape Town (Conard & Kandel, 2006), and renewed research efforts further north in coastal Namibia (Kinahan, 1991; Noli & Avery, 1987) might confirm this pattern for the pre-pottery (pre-2000 BP) sequence. On the other hand, and from a limited set of observations gathered in the Vredenburg Peninsula, signs for the intensified use of marine resources contemporary with the megamidden period are clearly

emerging (Smith, 2006; Yates, 2004). The systematic study of the poorly understood local pre-pottery sequence has great potential to reveal comparable observations to that in the Elands Bay and Lamberts Bay areas and also add unique insights related to its relatively different environmental setting. Likewise, a more complete reconstruction of forager lifestyles based on excavations and radiocarbon dating of several other sites along the south coast, more detailed physical anthropological work and faunal studies, generation of proxy-measures of occupational intensity at a regional and intra-site level, and analysis of material culture will test the possible existence and geographic extent of forager territories in the Plettenberg Bay area (fig. 2; Sealy, 2006). Also, the work of Binneman (2001, 2004/2005) in the Cape St Francis area of the Eastern Cape (fig. 1) outlining several variables affecting shellfish collecting strategies of different groups need further attention with the recovery of larger sample sizes and the use of explicit foraging models (e.g., Bird *et al.*, 2002; Bird and Bliege-Bird, 1997; Kelly, 1995). Further to the east along the coast lies largely *Terra Incognita* in terms of research devoted to understanding hunter-gatherer coastal adaptations, with very limited and tantalizing glimpses of coastal exploitation by early African Iron Age groups in the Durban area (fig. 1) (Horwitz *et al.*, 1991). Clearly, significant research efforts have been dedicated to reconstruct forager coastal adaptations in southern Africa, but much remains to be done on a sound empirical and theoretical basis.

## Acknowledgements

I am very grateful to Rosa Maria Albert (ICREA/ University of Barcelona) for having created the opportunity for these ideas to be explored in writing and for providing useful translations. Many thanks are also extended to Richard Klein (Stanford University) for providing updated faunal observations from all sites discussed here, Becky Ackerman (University of Cape Town) for bibliographic reference on baboon coastal behaviour, and to Fiona Archer (unaffiliated), Norman Schneider (unaffiliated), Lita Webley (University of Cape Town), and Belinda Mütti (Heritage Western Cape) for their support while this paper was written. Rene Navarro (University of Cape Town) compiled figures 3-5 and helped with figures 1 and 2. Field work at all sites mentioned here was made possible thanks to excavation permits issued by the National Monuments Council before 1999, the South African Heritage Resources Agency until 2003, and Heritage Western Cape thereafter. Several agencies and institutions provided the necessary research funds, namely the Wenner Gren Foundation (Gr. 5699), Foundation for Research Development (Government of South Africa), University Research Committee and Centre for African Studies (University of Cape Town), Swan Fund (Oxford University), and Kent Bequest Trust Fund (South African Archaeological Society).



## Resumen

# Explotaciones de los recursos marinos durante la Prehistoria en el sur de África con particular énfasis en la recolección de moluscos: oportunidades y continuidades

Este artículo pretende analizar la importancia de los recursos marinos en la dieta de las poblaciones recolectoras prehistóricas que ocuparon el sur de África (fig. 1) hasta hace aproximadamente unos dos mil años, cuando apareció por primera vez en el subcontinente una economía ganadera. Ahora bien, ¿fueron estos recursos marinos recolectados y consumidos simplemente porque eran fácilmente aprovechables por las poblaciones que visitaban la costa (continuidad)? o, por el contrario, ¿durante ciertos períodos, estos recursos marinos se convirtieron en un componente básico de la dieta debido a imperativos sociales (oportunidad) y a cambios evolutivos y/o culturales interviniendo, de este modo, varias covariables al mismo tiempo?

Más allá del enfoque adaptacionista, han sido escasos los estudios realizados hasta el presente que han intentado modelar o conceptualizar la importancia de los recursos marinos en la subsistencia de las poblaciones prehistóricas del sur de África durante la prehistoria. Esto se debe, quizás, a la fuerte influencia que el modelo de forrajeo (Lee, 1979, y Lee y DeVore, 1968) tuvo en los arqueólogos que han trabajado en esta región. Este modelo de forrajeo, así como los estudios culturales y ecológicos, particularmente, no dejaron mucho margen para la detección de cambios a escala diacrónica, ya que esas poblaciones eran entendidas como entidades prístinas, aisladas y autosuficiente en equilibrio con su ambiente (Kelly, 1995: cap. 2). Sin embargo, algunos autores han conceptualizado posibles limitaciones forrajeras a lo largo de la costa, por ejemplo, en un contexto de contacto cultural entre cazadores-recolectores y grupos ganaderos (Parkington

*et al.*, 1986), en otro caso con una fuerte dependencia de proteínas marinas de especies situadas en los niveles tróficos más elevados (por ejemplo, focas o peces depredadores) y que dotaría una posible circunscripción territorial (Sealy, 2006). Más aun; para algunos autores, la adquisición de recursos marinos fue crucial para el desarrollo del cerebro humano moderno gracias a la gran cantidad de ácidos grasos que contienen (Broadhurst *et al.*, 2002), mientras que, en opinión de otros, se subraya la posibilidad de que los moluscos marinos hayan sido decisivos en la supervivencia de esos primeros humanos, especialmente durante las condiciones glaciares adversas que tuvieron lugar durante el MIS6 (Marean *et al.*, 2007). Éstos son algunos de los intentos dedicados a modelar el uso de los recursos marinos; aunque pocos y con formulaciones todavía imprecisas, han intentado ir más allá de la historicidad reducida que ofrece el modelo de forrajeo.

En este artículo analizaremos varios modelos de subsistencia costera en África del sur a través de la presentación de tres ejemplos fechados durante los últimos 165 ka. A pesar de que se han tenido en cuenta variables ambientales y de adaptación, éstas no han sido consideradas como las únicas que moldearon los cambios evolutivos y/o culturales que tuvieron lugar durante ese período. A partir de estos tres ejemplos, intentaremos demostrar que hubo ciertos momentos durante la prehistoria en los que la adquisición de recursos marinos, y particularmente de moluscos, fue mucho más importante para los cazadores-recolectores que su recolección de carácter más bien oportunista durante visitas cortas a la costa.

## Ejemplo número 1

Hasta el momento, se han reconocido al menos dos especies de homínidos que tuvieron la capacidad suficiente para abandonar África y adaptarse a nuevos ambientes. Primero fue el *Homo erectus* que se dispersó por el Levante mediterráneo y Eurasia hace casi dos millones de años. La segunda especie serían los humanos modernos, *Homo sapiens sapiens*, que abandonó África hace unos 80-70 ka (Behar *et al.*, 2008, y Forster, 2004). Sin embargo, no hay que descartar la posibilidad de otras migraciones anteriores de modesto alcance, por parte de *Homo sapiens* arcaicos, que tendrían lugar hace unos 90 ka y que ocuparían el Levante mediterráneo (Klein, 2008, y Marean y Assefa, 2005). Las rutas de la salida de África que se sugieren para esta segunda migración incluirían el corredor del Nilo (Klein, 2008, y McBrearty, 2007), desde el este de África y a través del sur del Mar Rojo hacia la Península del Sinaí (Bailey *et al.*, 2007, y Klein, 2008), y a través del Sahara y hacia la costa mediterránea siguiendo canales de ríos, que hoy en día se encuentran bajo tierra (Osborne *et al.*, 2008). También se han identificado los márgenes costeros como otra posible ruta de salida de África (Erlandson, 2001; McBrearty, 2007, y Stringer, 2000).

A lo largo de la historia, tanto los grupos de no-homínidos como los de homínidos han recolectado moluscos y otro tipo de fauna marina para su subsistencia (Davidge, 1978; DeVore y Hall, 1965; Hockey y Bosman, 1988; Erlandson y Moss, 2001; Siegfried, 1977; Stiner, 1994, y Stringer *et al.*, 2008). Sin embargo, la recolección sistemática de estos recursos marinos conducente a la formación de concheros relativamente densos es parte de un patrón estrechamente relacionado con la actividad de los humanos modernos. Estas actividades ya se encuentran abundantemente documentadas en los yacimientos costeros de África meridional, particularmente en Sudáfrica, durante el período conocido en inglés como *Middle Stone Age* (MSA) (e.g., Avery

*et al.*, 2008; Henshilwood *et al.* 2001; Jerardino y Marean, e.p.; Thackeray, 1988; Volman, 1978). Se podría proponer que esta evidencia arqueológica sería el reflejo de una estrategia sistemática y prolongada en la adquisición de comida, que marca un comportamiento que va más allá de un simple oportunismo observado en otros homínidos y depredadores con acceso a un rango similar de biota al de los humanos modernos. Más aun, si pudiera probarse la existencia segura de recursos marinos durante una expansión territorial fuera de África, la existencia de una ruta costera no habría de ser asumida de manera inmediata, ya que la capacidad de las poblaciones de homínidos para explotar estos recursos de forma rentable es necesaria para que sean incorporados efectivamente a la dieta.

La diversidad en el rango de especies de moluscos identificados en los diferentes yacimientos de África del Sur durante el MSA varía considerablemente de uno a otro (fig. 2). Sin embargo, tan sólo de cuatro a siete especies dominan generalmente los conjuntos. La mayor parte corresponde a especies de costas rocosas, aunque en ocasiones las especies de costas arenosas (e.g., *Donax serra*) pueden dominar el conjunto de manera mayoritaria. Por ejemplo, en Pinnacle Point Cave 13B, en el sector Este de la cueva, fechado entre 100 y 110 ka por OSL (Jerardino y Marean, e.p.), la frecuencia de *D. serra* varía entre el 56 % y el 79 % por peso y entre el 60 % y el 80 % por NMI. En Klasies River Mouth (Thackeray, 1988), esta misma especie domina el conjunto de moluscos únicamente en una zona fechada hace unos 70 ka y con una abundancia del 70 %. Por otro lado, en Blombos Cave se registraron pequeñas cantidades de *D. serra*, (el 2 % por peso) en niveles fechados a 73 ka (Henshilwood *et al.*, 2001), mientras que en el abrigo de Ysterfontein 1 su presencia es del 2 % por NMI (Avery *et al.*, 2008) en niveles *circa* 110 ka.

La recolección de *D. serra* implica entrar en el mar durante la marea baja a una profundidad donde el agua llegue aproximadamente al nivel

de la cadera y tocando suavemente con los pies, ya que esta especie se entierra rápidamente cuando se la disturba. Los individuos más pequeños (30-45 mm de largo de concha) suelen enterrarse hasta unos 7 cm de profundidad, mientras que los individuos más grandes (45-60 mm de largo de concha) se encuentran entre 7 y 15 cm por debajo de la arena (McLachlan y Hanekom, 1979). Una vez que se localiza su rastro, se excava rápidamente con las manos para recoger tantos moluscos como sea posible antes de que puedan enterrarse más profundamente, una habilidad que la especie *Donax* ha desarrollado para sobrevivir en playas altamente dinámicas (Donn y Els, 1990). La ayuda de un contenedor y/o de otra persona que reciba lo que se reúne propiciaría colectas más voluminosas. Por otro lado, están los moluscos que habitan ambientes de roca, cuya recolección únicamente requiere, en la mayoría de los casos, entrar en aguas poco profundas durante la marea baja. Otro aspecto a tener en cuenta es la utilización de contenedores; éstos no son siempre necesarios en costas rocosas, ya que en la mayor parte de los casos los moluscos procedentes de la recolección se apilan sobre las rocas y son posteriormente trasladados a los campamentos (con o sin ayuda de contenedores). Tampoco parece ser estrictamente necesaria la ayuda de otro miembro del grupo para la recolección de los moluscos de roca, como en el caso de *D. serra*. Claramente, la recolección de *D. serra* implica algo más que una simple actividad de subsistencia, ya que la recolección sistemática de cantidades substanciales de esta especie no puede realizarse sin una anticipación y planificación previa, el uso de algún tipo de contenedor para guardar la cosecha y, posiblemente, la cooperación de otros miembros del grupo.

Hace unos 110 ka, con el inicio de la explotación sistemática de *D. serra*, los humanos modernos comenzaron a ampliar la diversidad de recursos usados, siendo así capaces de explotar de forma activa tanto las costas rocosas como las de playa. Esto contrasta con el carroñerismo pasivo

de mamíferos marinos y otras especies costeras. Por otro lado, y teniendo en cuenta la configuración paleoambiental del paisaje, esta ampliación en la capacidad de búsqueda de alimentos habría ayudado a estos tempranos *Homo sapiens sapiens* en el uso de la costa (entre otras posibles rutas) en la expansión territorial y la migración fuera de África desde hace al menos 110 ka.

### Ejemplo número 2

Como resultado de un aumento rápido del nivel del mar a finales del Pleistoceno, un buen número de yacimientos fue destruido. De los lugares que no fueron sumergidos por las aguas, la evidencia de ocupación más temprana a lo largo de la costa oeste de Sudáfrica procede de Elands Bay Cave (EBC), entre 17.500 y 20.000 BP (Parkington, 1988 y 1990) (fig. 3) durante el periodo conocido en inglés como *Later Stone Age* (LSA). Los escasos niveles de acumulación durante este episodio reflejan visitas muy esporádicas a EBC, en un momento en que la cueva era básicamente de interior, presentaba unas condiciones climáticas más frescas y húmedas, y el paisaje daba cobijo a una variedad de animales que incluía la presencia de grandes herbívoros (tabla 1). La ocupación de EBC continuó siendo esporádica hasta hace unos 11.000 años BP, cuando se identificaron los primeros niveles de conchas en un momento en el que la línea de costa se encontraba a unos 5 km de distancia. El aumento de los niveles de conchas que se observa en momentos posteriores está correlacionado con tasas de acumulación de material ocupacional mucho más rápidas. Sin embargo, aunque este aumento en la sedimentación pudiera explicarse por un cambio en la matriz sedimentaria más que por un reflejo en el uso del yacimiento (Parkington, 1988 y 1990), las frecuencias calculadas de artefactos tanto líticos como no-líticos, los restos de fauna vertebrada tanto marina como terrestre, y los fragmentos de huevos de avestruz no trabajados indi-

can un nivel de sedimentación más rápido, motivado por un uso más intensivo del sitio en un momento que va de los 11.000 a los 8.500 años BP, y que coincide con un cambio en la distancia del yacimiento respecto a la costa desde 5 km a unos cientos de metros (Parkington, 1981, 1988 y 1990). Las estimaciones aproximadas de los depósitos indican que cerca de la mitad de los depósitos de EBC son de este período y equivalen a unos 50 m<sup>3</sup> (Parkington, 1990).

El aumento en la cantidad de productos manufacturados *in situ* sugiere, no solo visitas más frecuentes a EBC sino también una ocupación más a largo plazo, reflejada asimismo en la cantidad de enterramientos fechados entre los 11.000 y los 8000 años (Morris, 1992). La falta de un registro estacional en los conjuntos de huesos de foca antes del 9.000 BP apunta también a una mayor frecuencia y/o visitas más largas a EBC (Woodborne *et al.*, 1995). Del mismo modo, la identificación de cantidades relativamente grandes de ocre durante el período que va de los 11.000 a los 8000 años indica también la posibilidad de una intensificación en las actividades rituales durante este tiempo. En resumen, la presencia de grupos sociales más grandes podría explicar este incremento, tanto en las actividades domésticas como en la intensificación de las actividades rituales y, por lo tanto, contribuirían a explicar esta mayor riqueza y diversidad del conjunto observadas en el período comprendido entre 11.000 y 8.500 BP (Parkington, 1981, 1988 y 1990).

En un ambiente posglacial cambiante, grupos de probablemente no más de 25 individuos altamente móviles y que representan, en general, una baja densidad de población, habrían necesitado agruparse temporal y periódicamente para poder satisfacer algunas de sus necesidades sociales más importantes: mantener y reforzar las redes sociales, garantizar el acceso a los recursos de subsistencia durante los tiempos más difíciles, reafirmar la identidad del grupo y la búsqueda de candidatos al matrimonio, etc. Muchas de las actividades que satisfacen y apoyan estos

imperativos sociales se enmarcan a menudo en un contexto ritualizado (Marshall, 1976; Silberbauer, 1981, y Wadley, 1978). La elección del lugar para realizar estas reuniones temporales sigue ciertos criterios, no siendo el menos importante la dimensión del asentamiento que cobijaría a un número relativamente importante de personas.

La posición de EBC, cerca del mar y con acceso a los recursos marinos, a la vez que a corta distancia de ambientes lacustres, ofrecía condiciones prácticamente ideales para la realización de estos encuentros entre diversos grupos. Tal como se documenta a partir de estudios etnográficos interculturales, los paisajes de costa permiten ocupaciones más permanentes, especialmente cuando se comparan con asentamientos puramente terrestres (Erlandson, 2001; Kelly, 1995, y Perlman, 1980). La selección del asentamiento en EBC y la explotación de los recursos marinos disponibles permitieron que, entre los 11.000 y los 8000 años, diferentes grupos se congregaran durante períodos relativamente largos para satisfacer así sus necesidades sociales. La fuerte dependencia de los recursos marinos se evidencia por la reducción del tamaño de las lapas y de los mejillones negros poco después de 10.000 BP, así como por la mayor explotación de peces y focas hacia 9500 BP. En caso de no haber existido EBC, es probable que otros asentamientos costeros hubieran asumido el mismo rol que este yacimiento durante los momentos de transición Pleistoceno/Holoceno. Las ventajas que este tipo de yacimientos dan a lo largo de esa particular línea de costa serían la previsibilidad, la fiabilidad y la relativamente alta productividad de los recursos marinos.

### Ejemplo número 3

Muchos yacimientos han sido identificados en la zona de Elands Bay y Lamberts Bay (fig. 3), en los cuales la tasa de sedimentación de los depósitos varía considerablemente a lo largo de los últi-

mos 8000 años (fig. 4). En el período que va del 3000 al 2000 BP, se observa un cambio radical en el tipo de asentamientos, que en este milenio se concentran por lo general inmediatamente detrás de puntas rocosas, lo que conllevó a la formación de concheros de gran tamaño (fig. 4). Debido a ese enorme tamaño, se acuñó el término «megaconchero» para referirse a este tipo de yacimientos cuando fueron descritos por primera vez hace algo más de treinta años (Parkington, 1976). Esos enormes concheros se caracterizan por poseer toneladas de conchas marinas y bajas densidades de artefactos y fauna terrestre (Buchanan, 1988; Jerardino, en prensa; Jerardino y Yates, 1997, y Parkington *et al.*, 1988). Apoyándose en estudios experimentales, Henshilwood *et al.* (1994) sostuvieron que los megaconcheros eran, en realidad, localidades para el secado y procesamiento de moluscos que formaban parte de una serie de asentamientos logísticos desde donde este recurso, una vez secado, era transportado para su consumo final en el interior del territorio. Sin embargo, la insuficiencia de fechas radiocarbónicas en los yacimientos del interior entre 3000 y 2000 BP (Jerardino, 1996: 87) no apoyan este escenario. Estudios posteriores muestran que las ingentes cantidades de conchas marinas presentes en estos megaconcheros han sesgado la percepción de estos sitios como carentes de restos de fauna y de otros elementos culturales. Significativamente, las estimaciones cuantitativas del total de huesos e industria lítica indican que la acumulación de este tipo de restos es mucho mayor en dichos megaconcheros que en otros yacimientos de cueva o abrigo contemporáneos localizados en un radio de 2 km desde la costa. Por lo tanto, estos lugares habrían sido utilizados, no sólo para el secado de grandes cantidades de moluscos, sino que también habrían servido para actividades relacionadas con la manufactura lítica y el procesado de alimentos de origen animal (Jerardino, e.p.; Jerardino y Yates, 1997).

En términos generales, se sugiere que, a medida que aumentó la población y las visitas al

lugar se incrementaron entre 4000 y 3200 BP, la movilidad de los grupos se vio restringida al litoral costero. Esta tendencia alcanzó su máxima expresión durante el siguiente milenio, entre 3000 y 2000 años atrás. Los asentamientos dentro o cerca de los megaconcheros parecen ser de tipo semisedentario y los contactos con las áreas del interior serían probablemente escasos. El registro de esqueletos humanos durante el Holoceno en la costa oeste del Cabo también respalda este aumento en la densidad de población (Sealy y Van der Merwe, 1988, y Lee-Thorp, *et al.* 1989). Destaca el hecho de que cerca del 40 % del número total de esqueletos identificados entre Lamberts Bay y Cape Point están fechados entre 3000 y 2000 BP (fig. 5b). Estudios recientes de antropología física muestran que los hombres y las mujeres de la región oeste del Cabo experimentaron, en grado significativo, un retraso en su crecimiento durante el período de los megaconcheros, probablemente como resultado de un estrés nutricional (Pfeiffer, 2010, y Pfeiffer y Sealy, 2006). El retraso observado en el crecimiento durante este milenio se superpone temporalmente con una mayor incidencia de la violencia entre los grupos recolectores, fenómeno evidenciado por los traumas craneales observados (Pfeiffer, 2010; Pfeiffer y Van der Merwe, 2004, y Pfeiffer *et al.*, 1999).

A pesar del crecimiento de la población, tan solo una pequeña parte de todas las cuevas y abrigos disponibles fueron ocupados durante el período de los megaconcheros. Parece que SBF y Pancho's Kitchen Midden (PKM) (fig. 4) fueron, respectivamente, la única cueva y el único abrigo visitados durante este período. Los estudios realizados sobre la industria y otras evidencias de ocupación sugieren que SBF fue utilizado regularmente como centro de reunión de grupos en el período que va de 2700 a 2500 BP, un patrón que bien pudiera haber tenido lugar ya en 3600 BP (Jerardino, 1996). La utilización de rituales en momentos de estrés y conflicto entre los diferentes grupos podría haber tenido lugar en forma

de bailes de larga duración, donde entraban en trance, así como en rituales de curación. Este tipo de actividades se ha observado también en situaciones similares de estrés social en grupos como los San (Guenther, 1975 y 1975/1976). Un modo de intercambio de regalos dentro de un contexto social similar al sistema de intercambio *hxaro*, que ha sido observado entre algunos grupos San del Kalahari (Wiessner, 1984), podría haberse desarrollado para suavizar la tensión ocasionada por el aumento de la población y el estrés nutricional y, posiblemente también, para conseguir el acceso a los recursos y los bienes de otras áreas más productivas. Sin embargo, después de 2500 BP, SBF dejó de ser un centro de congregación de bandas, función que desempeñaría otro u otros lugares, si bien no podemos descartar que dichos eventos pasaran a ser en general menos frecuentes.

Los análisis de isótopos de carbono (Sealy y Van der Merwe, 1988, y Lee-Thorp *et al.*, 1989) (fig. 5b) han indicado que, durante el período de los megaconcheros, la dieta de estas poblaciones se caracterizó por un aumento del consumo de productos marinos. Durante ese milenio, una gran parte de las proteínas consumidas, así como de productos altamente energéticos, se obtenían de los recursos marinos. Por el contrario, durante los últimos 2000 años, la dieta de estas poblaciones se caracterizó por un mayor consumo de proteínas, así como de carbohidratos de origen terrestre. Los índices calculados entre las cantidades de recursos de origen marino y terrestre para los yacimientos SBF y PKM indican también un fuerte aumento de los productos marinos consumidos en el período 4000-3500 BP y, particularmente, entre 2600 y 2500 BP (tabla 4). La eficiencia en la adquisición de recursos terrestres también se ha podido analizar durante el período de los megaconcheros a partir de aproximaciones estadísticas sobre la abundancia relativa

de tortugas terrestres y grandes mamíferos terrestres. La eficacia en la caza de mamíferos terrestres disminuye durante el período de los megaconcheros, siendo éstos raramente cazados entre 2600 y 2400 BP. Este momento coincide con el de mayor consumo de productos marinos, cuando el impacto ecológico sobre las dos especies de moluscos es evidente (Jerardino *et al.*, 2008), y con el incremento de la recolección de tortugas (fig. 5b y c, tabla 4) (Jerardino, en prensa).

Este registro muestra una dependencia progresiva y cada vez mayor de pequeñas presas tanto de origen marino como terrestre. Esta reconstrucción es consistente con los modelos de intensificación propuestos en la literatura actual sobre la adquisición de recursos por parte de las sociedades cazadoras recolectoras, y es el primero que se propone para la zona costera de África del Sur. La explotación de los recursos marinos permitió el establecimiento de densidades de población nunca vistas hasta entonces en la costa oeste de Sudáfrica durante el Holoceno, a la vez que permitió a estas sociedades forrajeras adaptarse a un tipo de economía semisedentaria. En un primer momento, cuando las sociedades cazadoras recolectoras empezaron a aumentar su población, su economía se basaba en la adquisición de productos terrestres; sin embargo, modificaron rápidamente estas estrategias con la adquisición de productos marinos, fundamentalmente moluscos, en un momento en que los niveles demográficos parecen haber sido más críticos. Los nuevos modelos de subsistencia y las oportunidades de nuevos asentamientos pudieron ser satisfechos gracias al consumo de productos marinos, siendo significativo el número de especies de tamaño pequeño que contribuyeron como fuentes de proteínas, las cuales habrían de ser complementadas con el consumo de alimentos energéticos (carbohidratos, aceites y grasas) tanto de origen terrestre como marino (Lee-Thorp *et al.*, 1989).

## Bibliography

- AMES, K. M., 1991, The archaeology of the *longue durée*: temporal and spatial scale in the evolution of social complexity on the southern Northwest Coast, *Antiquity* 65, 935-945.
- AMES, K. M., 1994, The Northwest coast: complex hunter-gatherers, ecology, and social evolution, *Annual Review of Anthropology* 23, 209-229.
- AVERY, G., 1985, Late Holocene use of penguin skins: evidence from a coastal shell midden at Steenbras Bay, Luderitz Peninsula, South West Africa-Namibia, *Annals of the South African Museum* 96 (3), 55-65.
- AVERY, G., HALKETT, D., ORTON, J., STEELE, T. & KLEIN, R. G., 2008, The Ysterfontein I Middle Stone Age rockshelter and the evolution of coastal foraging, *South African Archaeological Society Goodwin Series* 10, 66-89.
- BAILEY, G. N., 1978, Shell middens as indicators of post-glacial economies: a territorial perspective, in P. MELLARS (ed.), *The Early Post-glacial Settlement of Northern Europe*, Duckworth, London, 37-63.
- BAILEY, G. N., 2004, World Prehistory from the margins: the role of coastlines in human evolution, *Journal of Interdisciplinary Studies in History and Archaeology* 1 (1), 39-30.
- BAILEY, G. N., FLEMMING, N. C., KING, G. C. P., LAMBECK, K., MOMBER, G., MORAN, L. J., AL-SHAREKH, A. & VITA-FINZI, C., 2007, Coastlines, submerged landscapes, and human evolution: the Red Sea basin and the Farasan Islands, *Journal of Island & Coastal Archaeology* 2, 127-160.
- BALLY, R., MCQUAID, C. D. & BROWN, A. C., 1984, Shores of mixed sand and rock: an unexplored marine ecosystem, *South African Journal of Science* 80, 500-503.
- BASGALL, M., 1987, Resource intensification among hunter-gatherers: acorn economies in prehistoric California, *Research in Economic Anthropology* 9, 21-52.
- BEATON, J. M., 1991, Extensification and intensification in central California prehistory, *Antiquity* 65, 946-952.
- BEHAR, D. M., VILLEMS, R., SOODYALL, H., BLUE-SMITH, J., PEREIRA, L., METSPALU, E., SCOZZARI, R., MAKKAN, H., TZUR, S., COMAS, D., BERTRANDPETIT, J., QUINTANA-MURCI, L., TYLER-MITH, C., WELLS, R. S., ROSSET, S. & THE GEOGRAPHIC CONSORTIUM, 2008, The dawn of human matrilineal diversity, *The American Journal of Human Genetics* 82, 1130-1141.
- BIGALKE, E. H. & VOIGT, E.A., 1973, The interdisciplinary aspect of a study of shellfish exploitation by indigenous coastal communities, *South African Museums Association Bulletin* 10, 256-261.
- BIRD, D. W. & BLIEGE-BIRD, R. L., 1997, Contemporary shellfish gathering strategies among the Meriam of the Torres Strait Islands, Australia: Testing predictions of a central place foraging model, *Journal of Archaeological Science* 24, 39-63.
- BIRD, D. W., RICHARDSON, J. L., VETH, P. M. & BARHAM, A. J., 2002, Explaining shellfish variability in middens on the Meriam Islands, Torres Strait, Australia, *Journal of Archaeological Science* 29, 457-469.
- BINFORD, L. R., 1990, Mobility, housing, and environment: a comparative study, *Journal of Anthropological Research* 46, 119-152.
- BINNEMAN, J., 2001, An introduction to the Later Stone Age research project along the south-eastern Cape coast, *Southern African Field Archaeology* 10, 75-87.
- BINNEMAN, J., 2004/2005, Archaeological research along the south-eastern Cape coast Part I: open-air shell middens, *Southern African Field Archaeology* 13 & 14, 49-77.
- BOUEY, P., 1987, The intensification of hunter-gatherer economies in the southern North Coast ranges of California, *Research in Economic Anthropology* 9, 53-101.

- BROADHURST, C. L., WANG, Y., CRAWFORD, M. A., CUNNANE, S. C., PARKINGTON, J. E. & SCHMIDT, W. F., 2002, Brain-specific lipids from marine, lacustrine, or terrestrial food resources: potential impact on early African *Homo sapiens*, *Comparative Biochemistry and Physiology Part B* 131, 653-673.
- BROUGHTON, J. M., 1994a, Declines in mammalian foraging efficiency during the late Holocene, San Francisco Bay, California, *Journal of Anthropological Archaeology* 13, 371-401.
- BROUGHTON, J. M., 1994b, Late Holocene resource intensification in the Sacramento Valley, California: the vertebrate evidence, *Journal of Archaeological Science* 21, 501-514.
- BROUGHTON, J. M., MULLINS, D. & EKKER, T., 2007, Avian resource depression or intertaxonomic variation in bone density? A test with San Francisco Bay avifaunas, *Journal of Archaeological Science* 34, 374-391.
- BUCHANAN, W., 1988, *Shellfish in Prehistoric Diet: Elands Bay, SW Cape Coast, South Africa*, Cambridge Monographs in African Archaeology 31, British Archaeological Reports International Series 455, Oxford.
- BUSTAMANTE, R. H. & BRANCH, G. M., 1996, Large scale patterns and trophic structure of southern African rocky shores: the roles of geographic variation and wave exposure, *Journal of Biogeography* 23, 339-351.
- BUSTAMANTE, R. H., BRANCH, G. M. & EEKHOUT, S., 1997, The influences of physical factors on the distribution and zonation patterns of South African rocky-shore communities, *South African Journal of Marine Science* 18, 119-136.
- CONARD, N. J. & KANDELL, A. W., 2006, The economics and settlement dynamics of the later Holocene inhabitants of near coastal environments in the West Coast National Park (South Africa), in H.-P. WOTZKA, (ed.), *Grundlegungen: Beiträge zur europäischen und afrikanischen Archäologie für Manfred K.H. Eggert*, Narr Francke Attempto Verlag, Tübingen, 329-355.
- DAVIDGE, C., 1978, Ecology of baboons (*Papio ursinus*) at Cape Point, *Zoologica Africana* 13 (2), 329-350.
- DEACON, H. J., 1976, *Where hunters gathered: a study of Holocene Stone Age people in the eastern Cape*, South African Archaeological Society, Claremont.
- DEVORE, I. & HALL, K. R. L., 1965, Baboon Ecology, in I. DEVORE (ed.), *Primate Behavior*, Holt, Rinehart and Winston, New York, 20-52.
- DEWAR, G., 2008, *The Archaeology of the Coastal Desert of Namaqualand, South Africa: a regional synthesis*, British Archaeological Reports International Series S1761, Oxford.
- DONN, T. & ELS, S. F., 1990, Burrowing times of *Donax serra* from the south and west coasts of South Africa, *The Veliger* 33, 355-358.
- DÖCKEL, W., 1998, *Re-investigation of the Matjes River Rock Shelter*, University of Stellenbosch, Stellenbosch, unpublished MA dissertation.
- DURÁN, L. R., CASTILLA, J. C. & OLIVA, D., 1987, Intensity of human predation on rocky shores at Las Cruces in central Chile, *Environmental Conservation* 14, 143-149.
- ERLANDSON, J., 2001, The Archaeology of aquatic adaptations: paradigms for a new millennium, *Journal of Archaeological Research* 9, 287-350.
- ERLANDSON, J. & MOSS, M., 2001, Shellfish feeders, carrion eaters, and the archaeology of aquatic adaptations, *American Antiquity* 66, 413-432.
- FAITH, T., 2008, Eland, buffalo, and wild pigs: were Middle Stone Age, humans ineffective hunters?, *Journal of Human Evolution* 55, 24-36.
- FIELD, J. G. & GRIFFITHS, C. L., 1991, Littoral and sublittoral ecosystems of southern Africa, in A.C. MATHIESON, & P.H. NIENHUIS (eds.), *Intertidal and littoral Ecosystems*, Elsevier, Amsterdam, 323-346.
- FISHER, E. C., BAR-MATHEWS, M., JERARDINO, A. & MAREAN, C. W. (2010), Middle and Late Pleistocene Paleoscape Modeling along the Southern Coast of South Africa, *Quaternary Science Reviews*, 29: 1382-1398.



- FORSTER, P., 2004, Ice Ages and the mitochondrial DNA chronology of human dispersals: a review, *Philosophical Transactions of the Royal Society of London B* 359, 255-264.
- GRAYSON, D. K., 1984, *Quantitative Zooarchaeology*, Academic Press, Orlando, Florida.
- GRAYSON, D. K. & CANNON, M. D., 1999, Human palaeoecology and foraging theory in the Great Basin, in C. BECK (ed.), *Models for the Millennium: Great Basin Anthropology Today*, University of Utah Press, Salt Lake City, 141-151.
- GRIFFITHS, C. L., VAN SITTERT, L., BEST, P. B., BROWN, A. C., COOK, P. A., CRAWFORD, R. J. M., DAVID, J. H. M., DAVIES, B. R., GRIFFITHS, M. H., HUTCHINGS, K., JERARDINO, A., KRUGER, N., LAMBERT, S., LESLIE, R., MELVILLE-SMITH, R., TARR, R. & VAN DER LINGEN, C. D., 2004, Impacts of human activities on animal life in the Benguela – a historical overview, *Oceanography and Marine Biology* 42, 303-392.
- GUENTHER, M. G., 1975, The trance dancer as an agent of social change among the farm Bushmen of the Ghanzi District, *Botswana Notes & Records* 7, 161-166.
- GUENTHER, M. G., 1975/1976, The San trance dance: ritual and revitalization among the farm Bushmen of the Ghanzi District, Republic of Botswana, *Journal of the South West Africa Scientific Society* 30, 45-53.
- HALL, S., 1990, *Hunter-gatherer-fishers of the Fish River Basin: a contribution to the Holocene prehistory of the Eastern Cape*, Ph.D. thesis, University of Stellenbosch, Stellenbosch.
- HEEMSTRA, P. & HEEMSTRA, E., 2004, *Coastal Fishes of southern Africa*. Grahamstown: National Inquiry Service Centre, South Africa & the South African Institute for Aquatic Biodiversity.
- HENSHILWOOD, C., NILSSEN, P. & PARKINGTON, J., 1994, Mussel drying and food storage in the late Holocene, sw Cape, South Africa, *Journal of Field Archaeology* 21, 103-109.
- HENSHILWOOD, C. S., SEALY, J. C., YATES, R., CRUZ-URIBE, K., GOLDBERG, P., GRINE, F. E., KLEIN, R.G., POGGENPOEL, C., VAN NIEKERK, K. & WATTS, I., 2001, Blombos Cave, southern Cape, South Africa: preliminary report on the 1992-1999 excavations of the Middle Stone Age levels, *Journal of Archaeological Science* 28, 421-448.
- HOCKEY, P. A. R. & BOSMAN, A., 1988, Stabilizing processes in bird-prey interactions on rocky shores, in G. CHELAZZI & M. VANNINI, (eds.), *Behavioural adaptation to Intertidal Life*, Plenum Press, New York, 297-315.
- HOLLIDAY, T.W., 1998, The ecological context of trapping among recent hunter-gatherers: implications for subsistence in terminal Pleistocene Europe, *Current Anthropology* 39, 711-720.
- HORWITZ, L., MAGGS, T. & WARD, V., 1991, Two shell middens as indicators of shellfish exploitation patterns during the first millennium AD on the Natal north coast, *Natal Museum Journal of Humanities* 3, 1-28.
- INSKEEP, R. R. (ed.), 1987, *Nelson Bay Cave. Cape Province, South Africa: The Holocene Levels*, British Archaeological Reports International Series, 357 (i) + (ii), Oxford.
- JACOBS, Z., ROBERTS, R. G., GALBRAITH, R. F., DEACON, H. J., GRÜN, R., MACKAY, A., MITCHELL, P., VOGELSANG, R. & WADLEY, L., 2008, Ages for the Middle Stone Age of southern Africa: implications for human behaviour and dispersal, *Science*, 733-735.
- JERARDINO, A., 1995a, The problem with density values in archaeological analysis: a case study from Tortoise Cave, south-western Cape, South Africa, *South African Archaeological Bulletin* 50, 21-27.
- JERARDINO, A., 1995b, Late Holocene neoglacial episodes in southern South America and southern Africa: A comparison, *The Holocene* 5(3), 361-368.
- JERARDINO, A., 1996, *Changing Social Landscapes of the Western Cape Coast of Southern Africa over the Last 4 500 Years*. Ph.D. thesis, University of Cape Town, Cape Town.

- JERARDINO, A., 2003, Precolonial settlement and subsistence along sandy beaches south of Elands Bay, west coast, South Africa, *South African Archaeological Bulletin* 58, 53-62.
- JERARDINO, A., (in press), Large shell middens in Lamberts Bay, South Africa: changes in settlement, diet and hunter-gatherer resource intensification. *Journal of Archaeological Science*.
- JERARDINO, A., BRANCH, G. M. & NAVARRO, R., 2008, Human impact on Precolonial West Coast marine environments of South Africa, in T.C. RICK & J. M. ERLANDSON (eds.), *Human Impacts on Marine Environments: A Global Perspective*. University of California Press, Berkeley, 279-296.
- JERARDINO, A., HORWITZ, L. K., MAZEL, A. & NAVARRO, R., 2009, Just before Van Riebeck: glimpses into terminal LSA lifestyle at Connies Limpet Bar, West Coast of South Africa, *South African Archaeological Bulletin* 64 (189), 75-86.
- JERARDINO, A., KLEIN, R. G., NAVARRO, R., HORWITZ, L., ORTON, J., & BOOTH, C., (in prep.), Settlement and subsistence patterns during the terminal Pleistocene and Holocene at the Elands Bay and Lamberts Bay areas, in: A. JERARDINO & D. BRAUN (eds.), *The Archaeology of the West Coast of South Africa*.
- JERARDINO, A. & MAREAN, C. W., in press, Shellfish gathering, marine palaeoecology and modern human behavior: perspectives from Cave PP13b, Pinnacle Point, South Africa, *Journal of Human Evolution*.
- JERARDINO, A. & NAVARRO, R., 2008, Shell morphometry of seven limpet species from coastal shell middens in southern Africa, *Journal of Archaeological Science* 35, 1023-1029.
- JERARDINO, A. & YATES, R., 1997, Excavations at Mike Taylor's Midden: A summary report and implications for a re-characterisation of megamiddens, *South African Archaeological Bulletin* 52, 43-51.
- JOORDENS, J. C. A., WESSELINGH, F. P., DE VOS, J., VONHOF, H. B. & KROON, D., in press, Relevance of aquatic environments for hominins: a case study from Trinil (Java, Indonesia), *Journal of Archaeological Science*.
- KELLY, R., 1995, *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways*, Smithsonian Institution Press, Washington D.C.
- KEELEY, L. H., 1988, Hunter-gatherer economic complexity and «population pressure»: a cross-cultural analysis, *Journal of Anthropological Archaeology* 7, 373-411.
- KENNETT, D. J., 2005, *The Island Chumash: Behavioural Ecology of a Maritime Society*, University of California Press, Berkeley.
- KILBURN, R. & RIPPEY, E., 1982, *Sea Shells of Southern Africa*, Macmillan, Johannesburg.
- KINAHAN, J., 1991, *Pastoral Nomads of the Central Namib Desert: the People History Forgot*, New Namibia Books, Windhoek.
- KINAHAN, J. & KINAHAN, J. H. A., 1984, Holocene subsistence and settlement on the Namib coast: the example of the Ugab river mouth, *Cimbebasia* (B) 4, 59-72.
- KLEIN, R. G., 1981, Stone age predation on small African bovids, *South African Archaeological Bulletin* 36, 55-65.
- KLEIN, R. G., 2001, Fully Modern Humans, in G. M. FEINMAN & T. D. PRICE, (eds.), *Archaeology at the Millennium*, Plenum Press, New York, 109-135.
- KLEIN, R. G., 2008, Out of Africa and the evolution of human behaviour, *Evolutionary Anthropology* 17, 267-281.
- KLEIN, R. G. & CRUZ-URIBE, K., 1987, Large mammal and tortoise bones from Eland's Bay Cave and nearby sites, Western Cape Province, South Africa, in J. E. PARKINGTON & M. HALL (eds.), *Papers in the prehistory of the western Cape, South Africa*, British Archaeological Reports International Series 332 (i), Oxford, 132-163.
- KLEIN, R. G. & CRUZ-URIBE, K., 1996, Exploitation of large bovids and seals at Middle and Later Stone Age sites in South Africa, *Journal of Human Evolution* 31, 315-334.
- KLEIN, R. G. & STEELE, T., 2008, Gibraltar data are too sparse to inform on Neanderthal exploitation of coastal resources, *Proceedings of the National Academy of Sciences* 105(51), E115.

- KLEIN, R. G., AVERY, G., CRUZ-URIBE, K., HALKETT, D., PARKINGTON, J. E., STEELE, T., VOLMAN, T. P. & YATES, R., 2004, The Ysterfontein I Middle Stone Age site, South Africa, and early human exploitation of coastal resources, *Proceedings of the National Academy of Sciences* 101, 5708-5715.
- LEE, R. B., 1979, *The !Kung San: men, women and work in a foraging society*, Cambridge University Press, Cambridge.
- LEE, R. B., & DEVORE, I. (eds.), 1968, *Man the hunter*, Aldine, Chicago.
- LEE-THORP, J., SEALY, J., & VAN DER MERWE, N., 1989, Stable carbon isotope ratio differences between bone collagen and bone apatite, and their relationship to diet, *Journal of Archaeological Science* 16 (6), 585-599.
- MANHIRE, A., 1987, *Later Stone Age settlement patterns in the Sandveld of the south-western Cape Province, South Africa*, British Archaeological Reports International Series 351, Oxford.
- MANHIRE, A., 1993, A report on the excavations at Faraoskop Rock Shelter in the Graafwater District of the south-western Cape, *Southern African Field Archaeology* 2, 3-23.
- MAREAN, C. W., (in press), Fynbos, Shellfish, and Modern Human Origins: PP13B in context, *Journal of Human Evolution*.
- MAREAN, C. W. & ASSEFA, Z., 2005, The Middle and Upper Pleistocene African record for the biological and behavioural origins of modern humans, in A.B. STAHL (ed.), *African Archaeology*, Blackwell Publishing, New York, 93-129.
- MAREAN, C. W., BAR-MATTHEWS, M., BERNATCHEZ, J., FISHER, E., GOLDBERG, P., HERRIES, A., JACOBS, Z., JERARDINO, A., KARKANAS, P., MERCIER, N., MINICHILLO, M., NILSSEN, P. J., THOMPSON, E., TRIBOLO, C., VALLADAS, H. & WILLIAMS, H., 2007, Early human use of marine resources and pigment in South Africa during the Middle Pleistocene, *Nature* 449, 905-908.
- MAREAN, C. W. & CLEGHORN, N., 2003, Large mammal skeletal element transport: applying foraging theory in a complex taphonomic system, *Journal of Taphonomy* 1, 15-42.
- MAREAN, C. W., KARKANAS, P., GOLDBERG, P., NILSSEN, P., BAR-MATTHEWS, M., FISHER, E., HERRIES, A. & THOMPSON, E., (in press), The stratigraphy of the Middle Stone Age sediments at Pinnacle Point Cave 13B (Mossel Bay, Western Cape Province, South Africa), *Journal of Human Evolution*.
- MARSHALL, L., 1976, *The !Kung of Nyae Nyae*, Harvard University Press, Cambridge.
- MAZEL, A. D., 1989, People making history: the last ten thousand years of hunter-gatherer communities in the Thukela Basin, *Natal Museum Journal of Humanities* 1, 1-168.
- MCBREARTY, S., 2007, Down with the revolution, in P. MELLARS, K., BOYLE, O. BAR-YOSEF & C. STRINGER (eds.), *Rethinking the Human Revolution*, McDonald Institute Monographs, Oxbow Books, Oxford, 133-151.
- MCBREARTY, S., & BROOKS, A., 2000, The revolution that wasn't: a new interpretation of the origin of modern human behaviour, *Journal of Human Evolution* 39, 453-563.
- MCLACHLAN, A., & HANEKOM, N., 1979, Aspects of the biology, ecology and seasonal fluctuations in biochemical composition of *Donax serra* in the East Cape, *South African Journal of Zoology* 14, 183-193.
- MCLACHLAN, A., WOOLDRIDGE, T. & VAN DER HORST, G., 1979, Tidal movements of the macrofauna on an exposed sandy beach in South Africa, *Journal of Zoology*, 188, 433-442.
- NAGAOKA, L. A., 2001, Using diversity indices to measure changes in prey choice at the Shag River Mouth site, southern New Zealand, *International Journal of Osteoarchaeology* 11, 101-111.
- NOLI, D. & AVERY, G., 1987, Stone circles in the Cape Fria area, northern Namibia, *South African Archaeological Bulletin* 42, 59-63.
- ORTON, J., 2006, The Later Stone Age lithic sequence at Elands Bay, Western Cape, South Africa: Raw materials, artefacts and sporadic change, *Southern African Humanities* 18, 1-28.

- OSBORNE, A. H., VANCE, D., ROHLING, E. J., BARTON, N., ROGERSON, M. & FELLO, N., 2008, A humid corridor across the Sahara for the migration of early modern human out of Africa 120, 000 years ago, *Proceedings of the National Academy of Science* 105, 16444-16447.
- PARKINGTON, J. E., 1976, Coastal settlement between the mouths of the Berg and the Olifants rivers, Cape Province, *South African Archaeological Bulletin* 31, 127-140.
- PARKINGTON, J. E., 1981, The effects of environmental change on the scheduling of visits to the Elands Bay Cave, Cape Province, S. A., in I. HODDER, G. ISAAC & N. HAMMOND (eds.), *Patterns of the past*, Cambridge University Press, Cambridge, 341-359.
- PARKINGTON, J. E., 1988, The Pleistocene/Holocene transition in the western Cape, South Africa: observations from Verlorenvlei, in J. BOWER & D. LUBELL (eds.), *Prehistoric cultures and environments in the Late Quaternary of Africa*, British Archaeological Reports International Series 405, Oxford, 197-206.
- PARKINGTON, J. E., 1990, A view from the south: southern Africa before, during and after the Last Glacial Maximum. In C. S. GAMBLE & O. SOFFER (eds.), *The World at 18 000 B.P.: The low latitudes* (vol. 2), Unwin Hyman, London, 214-28.
- PARKINGTON, J. E., 2008, Limpet sizes in stone age archaeological contexts at the Cape, South Africa: changing environment of human impact?, in A. ANTICZAC & R. CIPRIANI (eds.), *Early Human Impact on Megamolluscs*, British Archaeological Reports International Series 266, Oxford, 174-184.
- PARKINGTON, J. E. (ed.), n. d., *Elands Bay Cave: a view on the past*, unpublished edited volume.
- PARKINGTON, J. E., C. POGGENPOEL, W. BUCHANAN, T. ROBEY, A. MANHIRE, & SEALY, J., 1988, Holocene coastal settlement patterns in the western Cape, in G. BAILEY & J. E. PARKINGTON (eds.), *The Archaeology of Prehistoric Coastlines*, Cambridge University Press, Cambridge, 22-41.
- PARKINGTON, J. E., NILSSEN, P., REELER, C. & HENSHILWOOD, C., 1992, Making sense of space at Dunefield Midden campsite, western Cape, South Africa, *Southern African Field Archaeology* 1(2), 63-71.
- PARKINGTON, J. E., YATES, R., MANHIRE A. & HALKETT, D., 1986, The social impact of pastoralism in the southwestern Cape, *Journal of Anthropological Archaeology* 5(4), 313-329.
- PERLMAN, S., 1980, An optimum diet model, coastal variability, and hunter-gatherer behaviour, *Advances in Archaeological Method and Theory* 3, 257-310.
- PFEIFFER, S., 2010, Cranial trauma as evidence of a stressful period among southern African foragers, in N. FERRIS, P. TIMMINS, C. WHITE & C. ELLIS (eds.), *The Compleat Archaeologist: Papers in Honor of Michael Spence*, London Chapter Ontario Archaeological Society (Occasional Paper No. 9) and Museum of Ontario Archaeology joint publication, Chapter 11, 259-271.
- PFEIFFER, S. & SEALY, J., 2006, Body size among Holocene foragers of the Cape ecozone, southern Africa, *American Journal of Physical Anthropology* 129, 1-11.
- PFEIFFER, S., VAN DER MERWE, N. J., PARKINGTON, J. E. & YATES, R., 1999, Violent human death in the past: a case from the Western Cape, *South African Journal of Science* 95, 137-140.
- PRICE, D. & BROWN, J. (eds.), 1985, *Prehistoric hunter gatherers: the emergence of cultural complexity*, Academic Press, New York.
- RUDNER, J., 1968, Strandloper pottery from South and South West Africa, *Annals of the South African Museum* 49, 331-663.
- SADR, K. & SMITH, A., 1991, On ceramic variation in the south-western Cape, South Africa, *South African Archaeological Bulletin* 46, 107-114.
- SAUER, C. O., 1962, Seashore – primitive home of man?, *Proceedings of the American Philosophical Society* 106, 41-47.
- SEALY, J. C., 2006, Diet, mobility, and settlement pattern among Holocene hunter-gatherers in southernmost Africa, *Current Anthropology* 47, 569-595.

- SEALY, J. C., MAGGS, T., JERARDINO, A. & KAPLAN, J., 2002, Excavations at Melkbosstrand: variability among herder sites on Table Bay, South Africa, *South African Archaeological Bulletin* 59, 17-28.
- SEALY, J. C. & VAN DER MERWE, N. J., 1988, Social, spatial and chronological patterning in marine food use as determined by <sup>13</sup>C measurements of Holocene human skeletons from the south-western Cape, South Africa, *World Archaeology* 20, 87-102.
- SIEGFRIED, W. R., 1977, Mussel-dropping behaviour of Kelp Gulls, *South African Journal of Science* 73, 337-341.
- SIEGFRIED, W. R., HOCKEY, P. A. R. & CROWE, A. A., 1985, Exploitation and conservation of brown mussel stocks by coastal people of Transkei, *Environmental Conservation* 12, 303-307.
- SADR, K. & SMITH, A., 1991, On ceramic variation in the south-western Cape, South Africa, *South African Archaeological Bulletin* 46, 107-114.
- SILBERBAUER, G., 1981, *Hunter and habitat in the central Kalahari desert*, Cambridge University Press, Cambridge.
- SKINNER, J. D. & SMITHERS, R. H. N., 1990, *The mammals of the southern African subregion*, University of Pretoria, Pretoria.
- SMITH, A. B., 1993, Exploitation of marine mammals by prehistoric Cape herders, *South African Journal of Science* 89, 162-165.
- SMITH, A. B., 1998, Keeping people on the periphery: The ideology of social hierarchies between hunters and herders, *Journal of Anthropological Archaeology* 17, 201-215.
- SMITH, A. B., 2006, *Excavations at Kasteenberg and the Origins of the Khoekhoen in the Western Cape, South Africa*, Cambridge Monographs in African Archaeology 66, British Archaeological Reports International Series 1537, Oxford.
- SMITH, A. B. & KINAHAN, J., 1984, The invisible whale, *World Archaeology* 16 (1), 89-97.
- SMITH, A. B., WOODBORNE, S., LAMPRECHT, E. C. & RILEY, F. R., 1992, Marine mammal storage: analysis of buried seal meat at the Cape, South Africa, *Journal of Archaeological Science* 19, 171-180.
- STAHL, A. B., 1993, Intensification in the west African Late Stone Age: a view from central Ghana, in T. SHAW, P. SINCLAIR, B. ANDAH & A. OKPOKO (eds.), *The Archaeology of Africa: food, metals and towns*, Routledge, London, 261-273.
- STEELE, T. & KLEIN, R. G., 2005, Mollusk and tortoise size as proxies for stone age population density in South Africa: implications for the evolution of human cultural capacity, *Munibe* 57, 5-21.
- STINER, M. C., 1994, *Honor among Thives: a Zooarchaeological Study of Neandertal Ecology*, Princeton University Press, Princeton.
- STINER, M. C., MUNRO, N. D. & SUROVELL, T., 2000, The tortoise and the hare: small-game use, the broad spectrum revolution, and Paleolithic demography, *Current Anthropology* 41, 39-74.
- STRINGER, C. B., 2000, Coasting out of Africa, *Nature* 405, 53-55.
- STRINGER, C. B., FINLAYSON, J. C., BARTON, R. N. E., FERNÁNDEZ-JALVO, Y., CÁCERES, I., SABIN, R. C., RHODES, E. J., CURRANT, A. P., RODRÍGUEZ-VIDAL, J., GILES-PACHECO, F. & RIQUELME-CANTAL, J. A., 2008a, Neanderthal exploitation of marine mammals, *Proceedings of the National Academy of Sciences* 105 (38), 14319-14324.
- THACKERAY, F., 1988, Molluscan fauna from Klasies River, South Africa, *The South African Archaeological Bulletin* 43, 27-32.
- VOIGT, E. A., 1982, The molluscan fauna, in R. SINGER & J. WYMER (eds.), *The Middle Stone Age at Klasies River Mouth in South Africa*, University of Chicago Press, Chicago, 155-186.
- VOLMAN, T. P., 1978, Early archaeological evidence for shellfish collecting, *Science* 201, 911-913.
- WADLEY, L., 1987, *Later Stone Age hunters and gatherers of the southern Transvaal: social and ecological interpretation*, British Archaeological Reports International Series 380, Oxford.

WASELKOV, G. A., 1987, Shellfish gathering and shell midden archaeology, *Advances in Archaeological Method and Theory* 10, 93-210.

WIESSNER, P., 1982, Risk, reciprocity and social influences on !Kung San economics, in E. LEACOCK & R. LEE (eds.), *Politics and history in band societies*, Cambridge University Press, London, 61-84.

WINTERHALDER, B., 1980, Environmental analysis in human evolution and adaptation research, *Human Ecology* 8, 135-170.

WINTERHALDER, B., 1981, Optimal foraging strategies and hunter-gatherer research in Anthropology: theory and models, in B. WINTERHALDER & E. A. SMITH (eds.), *Hunter-gatherer foraging strategies*, University of Chicago Press, Chicago, 13-35.

WOODBORNE, S., HART, K. & PARKINGTON, J., 1995, Seal bones as indicators of the timing and duration of hunter-gatherer coastal visits, *Journal of Archaeological Science* 22, 727-740.

WOODBURN, J., 1988, African hunter-gatherer social organization: is it best understood as a product of encapsulation?, in T. INGOLD, D. RICHES & J. WOODBURN (eds.), *Hunter and gatherers 1: History, Evolution and Social Change*, Berg, Oxford, 31-64.

YATES, R., 2004, *Archaeological Heritage Resources Assessment: Portion 37 of the Farm Uitkomst 23, Paternoster, Saldanha Bay Municipality, Western Cape Province*, unpublished report prepared for Deon Van Zyl Consultants, Iziko South African Museums, Cape Town.