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A Reply to comments by D. Bar-Yosef & M. Stiner on "Prehistoric Exploitation of Marine Resources in Southern Africa with Particular Reference to Shellfish Gathering: Opportunities and Continuities"

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I am very grateful to Daniella E. Bar-Yosef Mayer and Mary Stiner for their comments on an article I published in the previous issue of *Pyrenae*. Having spent many years working with coastal sites in South Africa and now settling in the Mediterranean academic landscape, I value the feedback from these two well-known archaeologists who have dedicated years of hard work in this later part of the world. Their opinions are very much appreciated for they allow me to bring new contexts to some of the (old) questions I have pursued in South Africa, an exercise that would help me with the process of broadening my research interests to the Mediterranean region.

It is interesting that Bar-Yosef Mayer pointed out that my paper focussed "on two major revolutions", namely the emergence of modern humans and the transition to domestication in the form of animal husbandry (rather than agriculture). The southern-most of South Africa, particularly the west coast of South Africa, is not blessed with the diversity and richness of terrestrial fauna and cultivable plants, such as cereals and legumes, as the Middle East. However, the west and south coasts of South Africa are known for their rich and productive shorelines at all trophic levels, particularly the former among the two. Hence, it seems that these "revolutions" or big adaptive leaps were supported and/or mediated to different degrees by marine resources in southern Africa, such as i) the ability to access and systematically exploit sandy shore environment after learning to do so on rocky platforms, which would have assisted modern humans to move out of Africa successfully

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and expand demographically during this process and afterwards; and ii) the ability to exploit marine resources intensively in a context of rising population levels and to develop a delayed-return economy that would have pre-adapted local foragers for the adoption of herding *c.* 2000 BP soon after its introduction from the northern regions. What would have happened if herding would have taken another 1000 years to make its appearance to the west coast of South Africa? In the face of depressing shellfish stocks and terrestrial fauna, would have local hunter-gatherers been pushed to domesticate some of the best candidates for this task among the locally available wild resources? Or would have solutions other than economic or technological have resolved this apparent impasse? These are important questions to consider if we are to understand cultural evolution in its diverse geographic and ecological contexts. The answers are difficult to formulate at this stage as only a small number of observations are available for the end of this resource intensification process ("the megamidden period"). Research (field work and development of models) in the near future is aimed at filling in this gap.

As for what happen to humankind during periods that are less well represented in South Africa such as the Upper Palaeolithic (UP), Epipalaeolithic and Neolithic, there are a few variables involved here, some related to archaeological observations (or lack of them) and others to labelling. As mentioned by Bar-Yosef Mayer, many South African sites (coastal and inland) during the European UP (the Later Stone Age in the local context) between about 90 and 25 ka and those covered by the Epipalaeolithic period in the eastern Mediterranean and the early Mesolithic in Western Europe are very likely to have been destroyed and/or submerged by rising post-glacial sea levels. Although some late Pleistocene and early Holocene occupational horizons have survived in a few elevated or inland sites along the west and south coasts (Mitchell, 2002), these are by no means ubiquitous as are late Holocene coastal sites. The destruction and inundation of past coastal sites is a matter that Bar-Yosef Mayer and Stiner also consider, respectively, to explain limited evidence for substantial shellfishing in the Levant at any given time and the more recent age for the same subsistence practice during the Middle Palaeolithic (MP) in the Mediterranean when compared to the South African evidence. One could then say that the vast majority of coastal sites anywhere in the world seem to have been erased from the observed material record at several stages during prehistory, not the least those particular to the regions under comparison here, where coastlines with steep or gentle bathymetry are found right through.

It is important to note also that there are very few *dated* South African sites in currently inland locations that date to between 90 and 25 ka (e.g., Jacobs *et al.*, 2008; Mitchell, 2002) when compared to the wealth of such sites in Europe and the Levant. Although interior locations in South Africa might well have been inhospitable during glacial periods (Marean, 2010), many thousands single-component Middle Stone Age (MSA) sites (some might be palimpsests of deflated horizons) consisting of lithic scatters found in the interior remain undated. The same could be said for numerous rock shelters with LSA surface deposits that are likely to include MSA basal material which remain undiscovered. Given the lack of stratigraphy, contextual/ stratigraphical integrity or absence of faunal

remains in these sites, researchers have directed their efforts to the coast where such concerns are not dominant (although there are many such undated or undateable lithic scatters along relict or raised beaches). Hence, obstacles regarding sea levels and local geology for comparing the Mediterranean and the Levant record with that of South Africa might not be a big issue other than the result of a relatively poorly dated MSA and early LSA record in South Africa and, why not, the possibility that *systematic* (as opposed to occasional) shellfish gathering developed earlier in southern Africa than elsewhere.

In connection to this last point, I acknowledged in my paper that Mossel Bay early date for the use of shellfish around 164 ka may not necessarily reflect the absolute earliest preserved evidence for the use of marine resources in the world. In fact, an earlier date for the use of marine molluscs is likely to be found with more intensified research as the corresponding early OSL date was determined from a well developed shell midden that implies a skill already in use for quite some time. Also, if future research shows that midden-like shell accumulations in the Indonesian region are the result of *Homo erectus* foraging (Joordens *et al.*, 2009), and if such behaviour could have also been present among Acheulean groups visiting the west coast of South Africa as they sourced quartzite beach cobbles for stone tool manufacture (David Braun, personal communication), then the problem of earliest use of marine resources seems to be a taphonomic one. The important point is not so much to find out where the earliest evidence for this behaviour is found, but to identify the several factors that are likely to be responsible for its material manifestation (behavioural, taphonomical or otherwise), its timing when considered within its ecological context and in relation to other prey, intensity of site usage and population levels among the most important variables.

Stiner points out that MP groups show considerable planning in hunting capabilities, great skill in the manufacture of lithic tools as well as a large brain capacity. This would place them close to the status of "modern" humans, and thus Stiner asks, how much more complex would have been for MSA people to collect *Donax* molluscs? Stiner also asks why people would have "shifted" to smaller prey, such as *Donax* sand mussels, as return rates and foraging costs must have been considered before doing so. In my opinion, current debates on markers of cognitive modernity among hominids is now a complex exercise and largely in the hands of specialists who seem to be able to identify mental processes behind lithic tool manufacture and the production of (proto) art (e.g., d'Errico *et al.*, 2003, 2005; Henshilwood *et al.*, 2009; Wurz, 1999). My concern is not so much about the use of these particular methodologies and theoretical modelling but the unchecked and underlying assumption that the only material expression of "modern" behaviour is like the one shown by us (*Homo sapiens sapiens*). This stance could result in raising the stake bar each time that evidence for one of a range of material expressions of modern behaviour (e.g., ability to manufacture complex tools, ability to hunt dangerous prey, the use of personal ornaments, etc.) is found among previously classified non-modern humans. This is a topic that merits whole collections of specialized papers (if not books) and thus not possible to tackle in a short reply on some other theme. Suffice to say that I remain open to consider well-doc-

umented evidence for early use of marine resources from any part of the world and look forward to see the development of new ways of analyzing this material for the purpose of evaluating its merit and for comparative purposes as well. I should also add that the enquiry brought into the procurement of *Donax* sand mussels stemmed partly from a desire to see malacological studies contributing more meaningfully to the debate around the origins and development of modern human behaviour in terms of foraging abilities, and particularly so in the South African context as much of the sediment volume at several MSA sites consists of marine shells (Avery *et al.*, 2008; Henshilwood *et al.*, 2001; Thackeray, 1988). Despite some important efforts (e.g., Avery *et al.*, 2008; Steele & Klein, 2005, 2008), marine shells resulting from subsistence activities have remained largely relegated to providing what could be considered background observations on palaeoenvironments, population levels and general information on subsistence. I hope that this situation will begin to change soon (Jerardino, 2010b).

When MSA groups brought large numbers of *Donax* sand mussels back to PP13B site around 110 ka they were not "shifting" their subsistence overall to smaller prey but rather adding them to a diet that already included mostly ungulate taxa and reduced numbers of small mammals and tortoises (Thompson, 2010; Rector & Reed, 2010). MSA people at PP13B were apparently eschewing the small terrestrial animals and focusing on hunting ungulates, particularly bovids, with no overwhelming preference for any particular body size (Marean, 2010). Very different palaeoclimatic conditions were dominant at the time of massive *Donax* collection (MIS5d – c, generally interglacial, distance to coast from site being close to 300 m) when compared to the preceding occupation when smaller quantities of rocky shore fauna was gathered (mostly MIS6, generally cold glacial conditions, distance to coast from site being close to 800 m). Surely, return rates and foraging costs must have been considered at each stage of PP13B occupation, with decisions being also mediated by differences in group size (more or less numbers of people to feed) and composition of its members (e.g., more or less numbers of people capable of hunting) (Kelly, 1995). Thus, rather than proposing "a significant expansion in diet breath", the exploitation of *Donax* by a sector of visiting groups (mostly women with the assistance of elderly and/or children?) was a smart and low-tech strategy for providing people with some calories, large amounts of easily digestible proteins and important trace levels of minerals while less predictable hunted prey was brought back to camps by others (mostly men?). Plant foods, probably gathered also by women, would have provided a reasonably balanced diet. This would have been an appropriate dietary solution in the context of larger groups and/or longer residential permanence near coastal environs as mirrored by late Pleistocene and late Holocene forager visits to the west coast (Jerardino, 2010a, b). In the context of population movement along significant stretches of coastline, being able to exploit both rocky shores and sandy beaches meant a thorough knowledge of and the capacity (cognitive and physical) to exploit coastal environments successfully, which would have *assisted* hominids with exiting Africa (another issue is whether modern humans knew whether they were moving out of a continent around 80-70 ka, see McBrearty, 2007).

Based on my observations in South Africa over the years and published data, the incidence of marine shells in Holocene coastal sites is noticeably larger than at MSA or MP sites. As pointed out by Stiner, it might be fruitful to compare densities of marine shells among these sites bearing in mind that such quantified data are a function of accumulation rates, length and frequency of visits as well as group size (Jerardino, 1995). As error margins involved in chronometric techniques used for dating Middle Pleistocene sites world-wide (e.g., OSL, U/Th series, TL) are relatively large, often greater than the ages determined for Holocene sites with radiocarbon dating, comparisons should perhaps rely on other indicators such as density ratios of marine resources against terrestrial fauna (Jerardino, 2010a, b). Although accumulation rates, time intervals and other unknown factors are virtually eliminated from this later comparison, issues such as different agencies behind the accumulation or removal of vertebrate fauna, density mediated destruction, and possibly also site clean-outs at some point and not others (Marean, 2010) ought to be considered. All things equal, comparisons based on density ratios could be used as a proxy-measure for gauging how much or little did hominids rely on marine resources. Being able to work with teams of people dedicated to study sites in different geographic settings around the Mediterranean and southern Africa would certainly help in this regard. I really look forward to be able to do so.

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