Early use of marine resources by Middle/Upper Pleistocene human societies: The case of Benzú rockshelter (northern Africa)

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ABSTRACT

This article examines the role played by marine resources for hunter-gatherer groups of the Middle/Upper Pleistocene in the geohistorical region around the Straits of Gibraltar, on the basis of new evidence collected at the rock shelter of Benzú (North Africa). The stratigraphic sequence at Benzú has been dated to between 254 and 70 ka. The excavations have revealed the exploitation of marine gastropods and bivalves, alongside fish. The most common taxon in the sequence is the genus *Patella*. The analysis of the molluscs and their spatial distribution shows that these animals were purposely collected by humans, probably as a food source. In order to contribute to the debate about the origins and scale of the exploitation of marine resources during the Middle and Upper Pleistocene, the evidence collected at Benzú is interpreted within the broader context of North Africa and southern Europe. The similarity of groups of *Homo sapiens sapiens* in North Africa and *Homo sapiens neanderthalensis* in southern Europe in terms of lifestyle and subsistence strategies is interpreted as reflecting equally similar social and economic practices, in spite of the diversity of anthropological perspectives on the relationship between humans and the environment currently in vogue.

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1. Hunter-gatherer societies and the exploitation of marine resources

Recent interdisciplinary research carried out in various parts of the world, for example southern Africa (Marean et al., 2007) and the Mediterranean basin (Vanhaeren et al., 2006; Colonese et al., 2011), is changing our perspective on hunter-gatherer societies in the Middle and Late Pleistocene, by demonstrating the important role played by shellfishing and the exploitation of other marine resources (Flemming et al., 2003). These practices have been attested on both shores of the Strait of Gibraltar (Finlayson, 2008,

2009; Stringer et al., 2008; Brown et al., 2011; Cortés et al., 2011; Ramos et al., 2011a,b; 2014b).

Recent advances in the field of anthropology and archaeology have posed a solid challenge to models primarily based on hunting – the ‘Man the Hunter’ hypothesis (Lee and De Vore, 1968). According to this hypothesis, hunting was the main economic practice in high latitudes, whereas fishing was predominant in mild latitudes (Lee, 1968: 42).

Nonetheless, a large proportion of anthropological and archaeological theories have insisted on regarding Middle and Upper Pleistocene human groups simply as hunter-gatherer societies. This idea is now being challenged by the recent stress on multidisciplinary studies that go beyond regional modelling, including, among others, kinship analysis, social studies, taphonomic analysis, resource analysis, gender studies, labour-division studies, the introduction of new perspectives to the analysis of artistic

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manifestations, territorial analysis and mobility analysis (Bate, 1982; Dennell, 1987: 30–31; Ingold et al., 1988; Otte, 1996; Gamble, 1999; Ramos, 1999).

In this regard, getting over the evolutionist perspective of 'needs' and 'limits' (Shalins, 1977) has been an important step for the recognition of the importance of vegetable and marine resources in the subsistence of human groups in the Middle and Upper Pleistocene. From our point of view, the role played by these resources goes even beyond the limited perspective offered by the 'broad spectrum economy' model (Stiner et al., 1999, 2000; Stiner, 2001). A varied diet is consubstantial to our species, "the evidence seems to suggest that a swing between economies based on one animal species and economies based on a wide range of resources took place in Europe in the Late Pleistocene" (Estévez et al., 1998: 17). Based on this idea, is therefore important to define which groups made marine resources a key factor in their subsistence in mild latitudes. Our analysis will not go into biotechnological questions regarding the relationship between technology and culture, but this is a recurrent issue in discussions concerned with the connection between biological change, essentially, the transition between Neanderthals and modern humans (Mellars, 1999; Zilhao, 2008), and the geographical expansion of economic practices (Martin and Klein, 1984; Klein, 2008).

In recent years, considerable progress has been made with regard to the association of several human groups and marine-resource exploitation practices. Specifically, in Atlantic and Mediterranean southern Europe, these economic strategies are being linked with groups of Neanderthals (Finlayson et al., 2006; Finlayson, 2008, 2009; Stringer et al., 2008; Zilhao et al., 2010; Colonese et al., 2011; Cortés et al., 2011), whereas in Africa these practices seem to be associated with *Homo sapiens sapiens* (Marean et al., 2007; McBrearty and Stringer, 2007; Jacobs et al., 2008; Collina-Girard and Bouzouggar, 2013). The evidence, therefore, suggests that marine resources played an important role in the subsistence of these groups, which may rightly be defined as hunter-gatherer-fishers.

The extraction of marine resources is also linked to the emergence of elements of personal adornment, ochre and 'artistic' behaviour; this is a widely debated issue in relation to the earliest

instances of symbolic thought (D'Errico et al., 2005), a field where recent research has also made considerable progress. It is now thought that African artistic manifestations are at least 35,000 years earlier (D'Errico et al., 2005, 2009) than those in Grotte Chauvet (Clottes, 2001; Geneste, 2005), one of the most outstanding examples of Palaeolithic art in southern Europe.

2. A global perspective on the evidence: the contrast between the European Mediterranean and the near eastern, North African and South African records

Growing interest in the reconstruction of prehistoric coastlines and the impact of glacioeustatic factors has allowed a more realistic perspective on coastal Pleistocene environments in different parts of the world. For example, multidisciplinary studies are currently evaluating the plausibility of land-bridges in connection with human dispersion (Otte, 2013). These new perspectives are opening avenues for the analysis of the relationship between human expansion and mobility and coastal environments during the Pleistocene (Flemming et al., 2003). For instance, the scientific interest of submerged coastal platforms has now been recognised. During cold periods in the Pleistocene, these platforms offered wide territories and ample resources to the inhabitants of caves and other sites located near the modern shoreline (Flemming et al., 2003; Rodríguez Vidal et al., 2004; Rodríguez Vidal and Cáceres, 2005; Chamorro et al., 2011).

In connection with this, the important role played by molluscs, and the marine resources in general, in the survival of hunter-gatherer groups, is being increasingly acknowledged (Erlandson, 2001; Finlayson et al., 2006; Marean et al., 2007; Bailey and Flemming, 2008; Fa, 2008; Colonese et al., 2011). We shall present evidence (Fig. 1) in support of the association of pre-Neanderthal and Neanderthal groups and these resources in southern Europe, and we shall then compare this data with that pertaining to groups of modern humans in Africa and the Middle East.

The earliest evidence in this regard, which was dated to c. 300 ka (Mode II- Acheulian), was found in the cave of Terra Amata (Nice, France) (De Lumley, 1966). This evidence relates to pre-Neanderthal

Fig. 1. Location map with the sites mentioned in the text (southern Europe, Middle East and North Africa): 1. Cueva de Figueira Brava; 2. Cueva de Ibn Amar; 3. Cueva del Higueral de Valleja; 4. Gibraltar; 5. Cueva Bajondillo; 6. Cueva Pernerias; 7. Cueva de los Aviones; 8. Terra Amata; 9. Cueva de Lazaret; 10. Grutta dei Moscerini; 11. Uçagizli; 12. Skhul; 13. Qafzeh; 14. Haua Fteah; 15. Oued Djebbana; 16. Rhafas; 17. Taforalt; 18. Ifri n'Amar; 19. Benzú.

groups, and the associated molluscs include *Ostreidae*, *Mytilidae* and *Patellidae*. The molluscs identified in the Cave of Lazaret (Nice, France), also related to Mode II-Acheulian technology and dated to MIS 6 (186–127 ka), included *Patellidae*, *Trochidae* and *Littorinidae* (Barrière, 1969).

Regarding the Iberian Mediterranean coast, our evidence for the relationship between the exploitation of marine resources and Neanderthal groups has increased substantially in recent years (Zilhão, 2001; Stringer et al., 2008; Finlayson, 2009; Zilhão et al., 2010). On the Portuguese Atlantic coast, an interesting animal assemblage has been attested at Grotta da Figueira Brava (Sesimbra), near Setúbal, south of Lisbon. This assemblage, found in association with Mode III-Mousterian technology, has been dated to c. 60 ka (Zilhão, 2012). The assemblage includes an interesting combination of sea and land species. Among the former, molluscs take a prominent position (especially *Patella vulgata*) but the presence of *Pusa hispida*, *Pinguinus impennis* and *Delphinus delphis* is also significant. It is believed that the presence of these species responds to scavenging activities practiced on beached animals (Tavares y Soares, 1998; Callapez, 2000; Zilhão, 2001, 2012).

Evidence for the exploitation of marine species has also been attested at other sites, such as Furninha (Peniche) (Bicho and Cardoso, 2010). Recent research has also increased our knowledge of the exploitation of marine resources in the Algarve. Evidence collected at the cave of Ibn Amar (Lagoa) and its hinterland has revealed the exploitation of small land species and of aquatic taxa in association with Mode III-Mousterian technology. The molluscs documented include *Mytilus* and *Cerastoderma*, which implies the proximity of the coastline (Bicho, 2001: 529). In this regard, João Zilhão has proposed a territorial model based on the exploitation of resources found in the immediate vicinity of habitation sites. Coastal locations were thus exploited within the regular mobility pattern of human groups, which also included inland settlements (Zilhão, 2001: 606).

Some interesting evidence has been compiled in the southernmost coast of the Iberian Peninsula, the Strait of Gibraltar (Fig. 1) and the Bay of Málaga, including the sites of Gibraltar (Finlayson, 2008, 2009) and Bajondillo (Cortés, 2007). In the southeast Iberian Peninsula, marine molluscs have been attested in association with Mode III-Mousterian technology at Cueva Perneras and Cueva de los Aviones (Montes, 1989). At both sites, species that inhabit rocky coastlines, such as *Phorcus turbinatus*, *Patella* sp and *Mytilus galloprovincialis* are clearly predominant, and amount to 98% of the total number of specimens. At Cueva de los Aviones, the animal remains are associated with a Neanderthal group and are dated to 50 ka. The shells could have been used for personal decoration, and some may preserve the remains of pigments (*G. insubrica* and *S. gaederopus*); some of these shells may have also been used as containers for body paints (Zilhão et al., 2010).

Regarding similar Central Mediterranean examples found in association with Mode III–Mousterian technologies, we must mention Grotta dei Moscerini (Lazio, Italy) dated to between 115 and 110 ka and 65 ka. Shells corresponding to infralittoral taxa (*C. chione* y *Glycymeris* sp.) are documented in all levels along with the remains of other marine species, for example *M. monachus* (Stiner, 1994). Some of these shells were used for tool manufacture (Vitagliano, 1984; Stiner, 1994).

In Africa and the Middle East, these remains are found in association with groups of *Homo sapiens sapiens*. The evidence for the eastern Mediterranean is still scant. We must now mention the classic sites of Skhul Cave and Qafzeh Cave (Israel), where marine shells were found in relation to groups of anatomically modern humans (Bar-Yosef Mayer, 2005; Vanhaeren et al., 2006). Good evidence for the exploitation of marine resources and molluscs has also been collected in the cave of Uçagizli (Turkey), dated to the

Early Upper Palaeolithic and the cave of Ksar'Akil (Lebanon) (Kuhn et al., 2001).

Concerning North Africa, one of the most interesting sequences is found at Haua Fteah (Cyrenaica, Libya), with a starting date around 100 ka (McBurney, 1967). Molluscs are present in the levels associated with Mousterian and Dabban (Upper Palaeolithic) industries (Hiscock, 1996). The species found at this site include *P. caerulea* and *Phorcus turbinatus*. The exploitation of these marine resources is related to groups of *Homo sapiens sapiens* (Barker et al., 2009). In Oued Djebbana (Algeria), perforated examples of *Nassarius gibbosulus*, dated to around 100 ka (Vanhaeren et al., 2006), have been attested; this species is valueless in nutritional terms, and was therefore exploited for symbolic reasons.

Another example of the use of perforated *Nassarius gibbosulus* shells for personal adornment in North Africa is the cave of Pigeons (Taforalt, Morocco), which is located approximately 40 km from the coast. The perforated shells were found in Aterian (Middle Palaeolithic) and Ibero-Mauritanian (Upper Palaeolithic) lithic technologies. The Group E-Aterian assemblage, which was dated to 82.5 ka, includes 13 beads crafted out of *Nassarius gibbosulus* shells (Bouzouggar et al., 2007: 9966). More evidence from this context was published later (D'Errico et al., 2009: 16052). These shells were not gathered for consumption, and were involved in redistribution processes between the coast and the interior. Some of the beads preserve microscopic remains of red pigment.

Similar perforated shells have also been found at the cave of Ifri n'Amar (Plaine de Guerouaou, Eastern Rif, Morocco), 59 km from the Mediterranean coast. These examples of *Nassarius* (Nami and Moser, 2010: 41) were found in association with Middle Palaeolithic Aterian technology and remains of red ochre. The chronology of this sequence is surprisingly old (Mikdad et al., 2004; Eiwanger, 2004; D'Errico et al., 2009: 16053; Nami and Moser, 2010: 264). A last example is Grotte Rhafas (Eastern Morocco), located 50 km from the Mediterranean coast, where the perforated shells are also associated with Aterian industries; the chronology for this assemblage is 80–60 ka (Wengler, 2001; D'Errico et al., 2009: 16053).

As previously noted, these inland North African sites are associated with Aterian technologies. The perforated and pigmented shells must have been part of distribution mechanisms connecting the coast and the interior, a phenomenon that has also been attested in South Africa. These evidences are an important contribution to the current debates about the progressive or sudden emergence of practices of personal decoration, which are taken to be a reflection of symbolic behaviour (D'Errico et al., 2009).

In South Africa, the earliest evidence for the exploitation of marine resources is dated to 164 ka at Pinnacle Point, a site related to groups of *Homo sapiens sapiens* (Marean et al., 2007). The site, which is important for the construction of the sequence of human expansion along the southern and eastern African coast, has been associated with the cold and dry MIS 6 period. Evidence for the use of pigments has been attested. The assemblage of marine invertebrates is of enormous interest, especially *Perna perna*, *Choromytilus meridionalis* and *Scutellastra argenvillei*. Most molluscs (Jerardino and Marean, 2010, 2014) were gathered in rocky environments and tide pools. From an adaptationist perspective, the exploitation of marine resources has been interpreted as a response to the lower productivity of land environments during cold periods (Marean et al., 2007: 906). Other South African coastal sites with evidence for the exploitation of marine resources are Blombos Cave and Klasies River (Jacobs et al., 2008).

Blombos has been dated to around 77 ka, and yielded very well-known fragments of ochre decorated with geometric motifs and shell beads, which have been interpreted as evidence for symbolic behaviour associated with modern humans (Henshilwood et al.,

2001, 2002; McBrearty and Stringer, 2007). A recent publication has mentioned the discovery at Blombos of two shells of *Haliotis midae* used for the manufacture of pigments. These shells were found in association with lithic instruments, which were employed to grind the ochre mineral, mammal bones and charcoal and stone fragments, which were contained within the shells (Henshilwood et al., 2011). All this is in addition to the site's interesting bone tool assemblage and the lithic tools typical of Middle Stone Age industries (Mourre et al., 2010). This South African evidence, therefore, is associated with Middle Stone Age industries and the beginnings of symbolic thought (McBrearty and Stringer, 2007; Jacobs et al., 2008) and demonstrate these groups' ability to gather different raw materials, mix them and use them in the course of social practices (Henshilwood et al., 2011).

3. The geohistorical region of the Strait of Gibraltar

The evidence suggests that, in the geo-historical region of the Strait of Gibraltar, fishing and shellfishing were important subsistence strategies (Vanne and Menanteau, 2004; Finlayson et al., 2006; Cortés, 2007; Stringer et al., 2008; Ramos and Cantillo, 2009; Cantillo et al., 2010; Ramos et al., 2011a,b; Ramos et al., 2014 b).

The analysis of Quaternary sea level changes in the region has yielded interesting results in recent years. Changes in sea levels are related to climatic changes (Zazo et al., 1997: 25). These analyses have been carried out on the coast of Malaga (Cortés and Simón, 2000; Rodríguez Vidal et al., 2007; Cortés, ed., 2007), the region around the Strait (Domínguez-Bella et al., 1995; Ramos et al., 2002; Gracia, 2008; Torres, 2008), Gibraltar (Fa et al., 2000; Rodríguez Vidal and Gracia, 2000; Abad et al., 2007, 2013) and the Atlantic coast of Cádiz (Menanteau et al., 1983; Zazo et al., 1999; Gracia, 1999, 2008). Sea level shifts have thus been documented at beaches and cliffs in the region, which is highly relevant for the use of marine resources, because it has contributed to a broader variety of species in both sandy and rocky environments (Gracia, 1999).

It seems clear that human occupation has been intimately connected with eustatic oscillations and their impact on the availability of marine resources. Coastal human settlements, associated with Mode II technologies, have been attested in the Bay of Málaga (Ramos Fernández et al., 2011–2012), the Atlantic coast of Cádiz (Ramos, 2008), and the region around the Strait of Gibraltar (Castañeda, 2008). At any rate, there is no evidence for the exploitation of marine resources by pre-Neanderthal groups in the region, which can only be associated with human groups characterised by Mode III technological assemblages (Finlayson et al., 2006; Stringer et al., 2008; Cantillo et al., 2010; Ramos et al., 2011a,b). The similarity of the record in Benzú (North Africa, near Ceuta), Cueva de Bajondillo (Bay of Malaga) (Rodríguez Vidal et al., 2007; Cortés, ed., 2007; Cortés, 2007), and Gibraltar (Stringer et al., 2008; Finlayson, 2009) illustrate a similar lifestyle and technological baggage (Mode III) on both shores of the Strait of Gibraltar.

4. North Africa: the rock shelter of Benzú

The rock shelter of Benzú is located in Ceuta, in the North African shore of the Straits of Gibraltar (Ramos et al., 2008, 2014 a; 2014 b; Ramos et al., 2011a,b; Ramos et al., 2013). The rock shelter is located at a distance of 230 m from the current shore line. Sedimentation studies have identified 10 stratigraphic levels (numbered from the base upwards). Levels 1–7 contain evidences of human occupation with lithic artefacts bone and shell, and a maximum depth of w 5.5. m. Benzú rockshelter is situated at 63 m.a.s.l. (Fig. 2), close to the stream of Algarrobo and the Bay of Ballenera, within a predominantly coastal environment. During

Fig. 2. Rock shelter of Benzú.

cold Quaternary phases, the sea level retreated as much as 120 m, which created an ample platform, currently submerged, from which the occupants of Benzú must have extracted a wide variety of resources.

A team from University of Cádiz, under the direction of José Ramos and Darío Bernal, has carried out six excavation seasons at the site. Excavation has revealed a stratigraphic sequence of ten strata (Fig. 3), seven of which contain evidence for human occupation during the Middle and Upper Pleistocene. Dates are available for strata 10 (Th/U, IGM: ± 70 ka), 7 (TL, Mad-3177: 74.9 ± 7.5 ka), 5 (OSL, Shfd 020136: 168 ± 11 ka), 3b (Th/U, IGM: 173 ± 10 ka), and 2 (OSL, Shfd 020135: 254 ± 17 ka). Micromorphology and bioerosion studies have confirmed that the formation of the rock shelter must be dated to MIS 9, and is therefore earlier than the first episode of human occupation (Abad et al., 2007).

The stratigraphic deposits are mostly composed of cemented calcite, and an unusual excavation methodology has had to be applied. First, blocks of soil ($25 \times 25 \times 15$ cm) were extracted with wedges. Afterwards, these blocks were excavated in the laboratory with compressed air micro-drills, and the location of the archaeological finds within precisely recorded (Domínguez-Bella et al., 2012). Animal remains were consolidated with Paraloid B⁷² dissolved in acetone (at 5%, 10% and even 30%, according to the specific hardness of the breccia) prior to extraction. In some cases, xylene was used instead of acetone, due to its higher degree of penetration into the molluscs' calcium carbonate. Hammers and chisels were also used in the excavation process.

Pollen analyses have yielded a homogeneous composition throughout the sequence. Regionally, the most significant taxon is *Cedrus* and, to a lesser extent, *Pinus*. Locally, vegetation was dominated by *Quercus*-p (holm oak), *Olea*, carob trees and riverside taxa, for example *Alnus*, *Salix* and *Ulmus*. Grasses are dominated by steppe-species (*Artemisia*, Asteraceae and Chenopodiaceae). Bushes, among which Ericaceae and *Juniperus* were the most common species, did not play a significant role in the plant environment. The prevalent Mediterranean environmental conditions were generally dry, but the presence of more or less permanent water courses and water pools favoured the development of riverside and water taxa. The sequence attests to environmental oscillations and shifts within a general trend towards progressively drier conditions over time. The cyclical variations resulted in the expansion of woods inhabited by Mediterranean and temperate species, a varied population of grasses and bushes and a high presence of riverside and water taxa (Ruiz Zapata and Gil, 2013). The analysis of the oxygen and carbon isotopes present in mollusc shells, currently under way, is expected to reveal more details about the climatic and environmental conditions in the Strait of Gibraltar during the periods of occupation of the rock shelter.

Fig. 3. Section of the rock shelter of Benzú.

Abundant land animal remains have been found, including mid- and small-sized bone fragments. These remains are the product of intense human activity. Specifically, the remains include bone fragments and splinters belonging to mid-sized mammals and a considerable number of fragments identified as the humeral diaphysis of mid-sized ungulates, intentionally fractured and burnt. Remains corresponding to bovine mammals and other herbivores have also been found (Monclova et al., 2013).

Regarding raw materials for the manufacture of stone tools (over 36,000 industrial remains have been identified to date), silica-rich types of stone were clearly predominant. Among these, we can distinguish between Tertiary silicate-rich compact sandstones (of different colours); red, purplish and greenish radiolarites; homogeneous, black-speckled, yellowish flints; and homogenous or oolitic white flints (Domínguez-Bella et al., 2013). Other lithologies have been attested, but in insignificant proportions.

The result of several archaeological surveys carried out in the region has revealed that most of these raw materials are local in origin. Jurassic radiolarites originate on the NE face of Jebel Musa, but are eroded away as far as the beaches on Bay of Ballenera, near the modern village of Benyounes. The Tertiary local sandstones, which present different colours and grain size, are to this day easy to find in the central area of the bay. Homogenous and oolitic flints are sourced somewhat farther away, but still within the region. They are found in Jurassic calcareous and dolomitic rocky outcrops rich in workable cores (Domínguez-Bella et al., 2013).

Mode III-Mousterian is the predominant lithic technology. The Levallois technique is especially abundant, and centripetal cores are especially common among BN1G. Internal chips are numerous, as are those associated with the beginning of the knapping process and the Levallois technique. The retouched tools (BN2G) include racloirs and points, and the use of notches and denticulate edges is frequent (Ramos et al., 2014 b; 2014a).

Functional analysis (Semenov, 1964) applied to a sample representing the whole sequence (Clemente, 2013) points towards a variety of productive activities related to the exploitation of animal and vegetal resources. The use of hafted tools is attested in stratum 4. The tools manufactured out of local sandstones are particularly well crafted, and have very sharp edges.

5. Marine resources in the rock shelter of Benzú

The rock shelter of Benzú is yielding clear evidence of the exploitation of coastal resources, especially molluscs, which are present in all levels (Fig. 4) between strata 7 and 1; ichthyofauna (Fig. 5) are especially abundant in level 5a (Ramos et al., 2011a,b; 2014; Cantillo and Soriguer, 2011; Cantillo, 2012, 2013).

Fig. 4. *Patella vulgata* and fish vertebrae. Stratum 5. Benzú.

Fig. 5. Plan and section to the position of animals remains (shells and land animals), rock shelter of Benzú.

In order to ensure the comparability of results, we have used the database CLEMAM (Check list of European marine mollusca), published by the Muséum national d'Histoire naturelle (Paris). Taxonomic identification has relied on bibliographic sources (Sabelli, 1982; Lindner, 1983; Poppe and Goto, 1993; Hayward and Ryland, 1996; Hayward et al., 1998; Gofas et al., 2012) and the mollusc collection of the zoology laboratory at the Faculty of Sea Sciences, University of Cádiz. It has not been possible to taxonomically and anatomically identify all specimens with as much precision as could have been wished. In some cases, therefore, identification beyond class has proven unattainable. For quantitative analysis we have used standard biological indices (Moreno Nuño, 1994; Gutiérrez Zugasti, 2009; Cantillo, 2012). Thus, Minimum Number of Individuals (MNI) has been calculated on the basis of Number of Remains (NR).

Concerning molluscs, the vast majority of identified remains (Table 1) correspond to gastropods (99.3%), and a small proportion to bivalves (0.7%). Among the gastropods, the patellidae family is clearly predominant in all strata (97.8%) (Fig. 4), followed far behind by the Siphonariidae (1.5%) (among which the *Siphonaria pectinata* is the most common species). The most common patellidae species are *Patella vulgata* and, in smaller proportions, *Patella ferruginea*, *Patella caerulea*, and *Siphonaria pectinata*. Bivalves are represented

by a fragment of *Ruditapes decussatus* in stratum 6. In absolute terms, the number of samples analysed is not large, as only 10% of the site has been excavated to date. In consequence, limpets are by far the most common mollusc in Benzú. This was a local species, easy to access and an obvious resource for the inhabitants of the site. These animals adhere to rocks located in the intertidal area, where they form large colonies all year round. They are not greatly exposed to the surf, and are above water for long periods, so their collection is not difficult, and is amenable to their exploitation as a complementary source of nourishment. In addition, they can be collected by recourse to simple tools, such as beach pebbles.

From the taphonomic point of view (Gautier, 1987), the main process observable in the shells of Benzú is cementation, caused by the long exposure of the shells to water permeated soils, provoking the accumulation of calcium carbonate. This factor has impeded to obtain information through functional analysis of the shell edges (Cuenca Solana, 2013). All taxa documented to date were collected for consumption, as shown by the accumulation of discarded shells in specific areas of the site, especially in stratum 5 (areas 135, 136 and 137). The identification of this sector as an area dedicated to food consumption is confirmed by the remains of land animals (bovinae), some of which show traces of exposure to fire (Fig. 5).

Table 1

Taxonomic variability between levels: NISP: Number of Identified Specimens; MNI: Minimum Number of Individuals.

Stratum	Sediment type	Date	Taxon	Quantification	
				NISP	MNI
7	Cemented breccia	74 ± 7 ka.	<i>Patella caerulea</i>	2	2
			<i>Patella vulgata</i>	2	2
			<i>Siphonaria pectinata</i>	1	1
6	Micritic lime		<i>Patella vulgata</i>	22	9
			<i>Ruditapes decussatus</i>	1	1
			<i>Patella vulgata</i>	62	28
5	Sands and limes	168 ± 11 ka.	<i>Siphonaria pectinata</i>	1	1
			<i>Patella vulgata</i>	31	15
			—	—	—
4	Pebbles and limes	173 ± 10 ka.	<i>Patella vulgata</i>	4	2
3b	Speleothen		<i>Patella vulgata</i>	2	2
3	Micritic lime		<i>Patella ferruginea</i>	1	1
2	Pebbles and sand	254 ± 17 ka.	<i>Patella vulgata</i>	8	4
1	Breccia		—	—	—
TOTAL				137	68

Alongside these molluscs, the remains of up to seven well-preserved articulated fish vertebrae were found in level 5a (cemented sands and limes). These remains have been dated with OSL to 168 ± 11 ka.

6. Evidence in the south of the Iberian Peninsula and the Strait of Gibraltar: Bajondillo and Gibraltar

Cueva del Bajondillo (Torremolinos, Málaga) is located at a distance of 200 m from the current coastline and about 15 m.a.s.l. The maximum level pleniglacial coast was - 110/120 m. The 5.4 m deep stratigraphic sequence includes twenty archaeological strata, spanning the Middle Palaeolithic to the Neolithic. Level Bj19 is fully in character with the Middle Palaeolithic in the south of the Iberian Peninsula (Cortés, ed., 2007). The evidence for the exploitation of marine resources is associated with Mode III technologies practiced by Neanderthals, and has been dated to 150 ka. Researchers working on the site have made a coherent case for the parallels between this evidence and that being investigated in South Africa. Nine categories and five species of marine invertebrate have been attested. The most abundant species is the mussel *M. galloprovincialis*. Two bivalves (*Glycymeris* sp. and *Tracia* sp.), the barnacle *Balanus trigonus*, the snail *Stramonita haemastoma*, and two further bivalves (*Donacilla cornea* and *Glycymeris panopea*) have also been identified. On the basis of the current habitats, the team working at the site believe that these molluscs were collected from the rocks or the beach during tidal ebbs (Cortés, 2007: 2).

Also on the northern shore of the Strait, several caves in Gibraltar have yielded evidence for the presence of some of the last Neanderthal communities in Europe (Finlayson et al., 2006). Carbon, pollen, wood and animal remains (belonging to both land and marine animals) clearly indicate a hunter-gatherer economy which also included the exploitation of marine resources. The most interesting evidence comes from Gorham's Cave. Excavations begun in 1999 have revealed four archaeological levels. We shall focus on the two levels associated with Palaeolithic occupation: Level III, associated with Solutrean technology of the Upper Paleolithic; and Level IV, associated with Mousterian technology of the Middle Palaeolithic. Calibrated radiocarbon dates for hearths found in Level IV point to a chronology around 29–28 ka (Finlayson, 2009). Land animal remains show human-made cuts and other marks which suggest that the animals were butchered prior to their transportation to the cave. The environment in which this community lived has been defined as 'a piece of Africa in Europe' (Finlayson, 2009: 143).

Pollen and animal remain analyses have resulted in the identification of plant and animal species characteristic of sandy plains, wooded areas, swamps, cliffs and coastal areas. Specifically, the specimens identified point towards shifting sand dunes and wooded savannahs inhabited by stone pines, cork oaks and Spanish juniper. Areas of denser vegetation can also be attested at riverside locations (Finlayson et al., 2008); species included willows and reeds; lakes and lagoons were inhabited by ducks and other birds, along with frogs, toads and tortoises. The Spanish ibex, which is also present in the record, lived in the rocky areas around modern Gibraltar (Finlayson, 2009: 147). During cold periods – when the sea was between 80 and 120 m lower than today, opening a wide land platform, now under water – the ecosystem was similar to that currently found in the relict of Doñana, in the south west of the Iberian Peninsula. The shoreline would be nearly 5 km distant from the cave, and wide beach expanses opened up around modern Gibraltar. The current sea terraces are the remains of stepped paleo-beaches (Fa et al., 2000; Rodríguez Vidal and Gracia, 2000; Rodríguez Vidal et al., 2004).

Hunted large species included *Sus scrofa*, *Equus caballus* and *Bos primigenius* (Currant, 2000), and especially *Capra pyrenaica* and *Cervus elaphus*. Smaller animals included tortoises, rabbits – the most common – and birds. The remains of *Patella* and *Mytilus*, as well as *Monachus monachus*, *Delphinus delphis* and fish, clearly attest to the exploitation of the marine environment (Stringer et al., 2008; Brown et al., 2011).

The evidence from Gibraltar has demonstrated the importance of a varied economic strategy for Neanderthal groups, including the exploitation of small land mammals and marine resources, and their advanced technological, cultural and social level (Brown et al., 2011: 266). Cueva de Higueral de Valleja, also in the south of the Iberian Peninsula, near the Guadalete River and approximately 50 km away from the current coastline (Jennings et al., 2009) has yielded a complete stratigraphic sequence encompassing Mousterian and Upper Palaeolithic technologies. Stratum 5 is associated with Mode III-Mousterian technologies and remains of *Pecten maximus*, which shows mobility and contact between human groups in the coast and the interior.

7. Conclusions and synthesis

The exploitation of marine resources during the Middle and Upper Pleistocene is a current topic of scholarly debate worldwide. In southern Europe, both on the Atlantic and the western and central Mediterranean shores, these economic strategies were carried out by groups of *Homo sapiens neanderthalensis*. In the Middle East and North Africa (Vanhaeren et al., 2006; Colonese et al., 2011) research has been uneven for various reasons (Marean et al., 2007; McBrearty and Stringer, 2007); in regions such as South Africa, where research has been especially intense, the evidence for these economic strategies is related to groups of *Homo sapiens sapiens*.

At any rate, the issue is open to multiple approaches involving complex factors, for instance the evolution of the human species and the emergence of social and economic practices which, traditionally, are inflexibly associated with modern humans. The matter, therefore, is but a strand of one of the most important debates about prehistoric society. To date, 'Out of Africa' explanations supported by the 'human revolution' paradigm have had the upper hand in these debates (Mellars and Stringer, 1989; Mellars, 1994; Mellars et al., 2007; Mellars and French, 2011). This idea has been challenged by critical perspectives (McBrearty and Brooks, 2000; McBrearty, 2007) that argue for the gradual emergence of different innovations for a period of over 200,000 years. According to this approach, some modern behavioural patterns, such as diversification of economic strategies, the exploitation of marine resources and the emergence of symbolic thought and artistic manifestations had their origin in the Middle Palaeolithic. There are other approaches, which argue for a more polygenic perspective on technology and behaviour in the Late Middle Pleistocene and the Upper Pleistocene (Conard, 2005).

The dominant model (based on the 'human revolution' paradigm) considers that some factors of progress, for example the exploitation of marine resources and the emergence of symbolic practices – use of ochre, perforated shells, personal adornment – were primarily associated with modern humans. The debate has been affected by the alleged dissociation between biology and culture, and as a result Neanderthals have been consistently underrated.

The evidence from southern Europe demonstrates that Neanderthals already had social practices consistent with shellfishing and other forms of exploitation of marine resources which are very similar to those present among modern humans. Furthermore, the record in Higueral de Valleja (Cadiz) and Cueva Antón (Murcia),

among other sites, confirm mobility and contact between coastal and interior zones (Jennings et al., 2009; Zilhão et al., 2010). In conclusion, economic practices of groups of Neanderthals and of *Homo sapiens sapiens* in North Africa, as shown by the evidence collected in Taforalt (Bouzouggar et al., 2007; D'Errico et al., 2005) and Ifri n'Ammar (Mikdad et al., 2004; Nami y Moser, 2010) in the eastern Rif (Morocco), were remarkably similar. These practices involved the mobility of human groups between the coast and the interior, as shown by the presence of the remains of marine resources in interior areas.

From our methodological perspective (Arteaga et al., 1998; Ramos, 1999, 2012; Arteaga, 2002), we believe that, despite the usual, biologically-based distinction between two different human groups, hunter-gatherer-fishers on both shores of the Strait of Gibraltar had similar economic practices and lifestyles. This is a momentous debate, as it concerns the very biological conceptualisation of the human race. Shellfishing is increasingly being regarded as a significant activity for the process of evolution. This debate is especially active with regard to East and South Africa, where for different circumstances most of the research has been focused.

The situation is changing. New chronologies and sequences from North Africa, specifically in the region around the Strait of Gibraltar, for example Benzú, confirm that these practices were consistently pursued for over 250,000 years. This chronology predates the earliest instances in South Africa by nearly 70,000 years. Whereas in South Africa these economic practices are associated with Middle Stone Age technologies (McBrearty and Brooks, 2000; Conard, 2005), in Benzú they are related to Mode III-Mousterian technologies. Although little more can be said regarding the specific identity of the practitioners of these technologies, they share economic and technological practices with the inhabitants of Bajondillo or Gibraltar, on the northern shore of the Strait (Finlayson et al., 2006; Cortés, 2007).

The geohistorical region of the Strait of Gibraltar has much more to offer. Benzú and other sites in northern Morocco are guaranteed to have an important impact on the debate.

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