Similarities and differences in the lifestyles of populations using mode 3 technology in North Africa and the south of the Iberian Peninsula

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ABSTRACT

In the geohistorical region of the Strait of Gibraltar, which includes the south of the Iberian Peninsula and North Africa, important research has been carried out in recent years. This research has allowed us to document the presence of human groups as early as the Middle Pleistocene.

Classical anthropology refers to these groups using various terms *Homo Neanderthalensis* in the south of Europe and *Homo sapiens sapiens* in North Africa). The current records exhibit important similarities concerning lithic technology (the so-called 'Mode 3', 'Mousterian' or 'Middle Stone Age'), and the exploitation of marine resources.

From an anthropological or cultural perspective, both groups were hunter-gatherers with similar lifestyles. Bearing these similarities in mind, three hypotheses are here presented.

1. Introduction

The 'Out of Africa' traditional perspective maintained that mankind and its technological and cultural baggage expanded throughout eastern Africa and the Middle East. This cultural baggage included chipped stone tools; specialised hunting practices; the exploitation of marine resources; the use of bone tools, and personal ornaments, such as perforated shells or teeth, and ochre; and the emergence of artistic expression (Mellars, 1973, 1994, 1999; Mellars et al., 2007; White, 1982; Straus and Bar Yosef, 2001).

Genetic and mitochondrial DNA studies have concluded that all humanity originated relatively recently in Africa (Cann et al., 1987). Following this line of thought, the chronology was relatively short (no longer than 200 Ka) and the hybridisation of archaic and modern types was rejected (Stringer and Gamble, 1993; Stringer, 2002).

The 'Out of Africa' model was challenged by the multiregional model (Wolpoff, 1999), which maintained an early diaspora of *H. erectus*, and different regional trajectories thereafter. In this model, South-West Europe and North Africa followed their own evolutionary lines.

In recent years, the notion of a single route through the Middle East, followed by the full substitution of populations, has gained support

(McBrearty and Brooks, 2000; McBrearty, 2007; Stringer, 2002). Recent data from Misliya Cave have pushed back the dispersion of the *Homo sapiens* through the Levant around 220 Ky (Hershkovitz et al., 2018).

Over time, the contending models have been perfected (Rosas, 2010, 2016), and new proposals have been put forth, such as that which advocates for a recent origin in Africa and assigns a role to hybridisation, and that based on assimilation, which supports the African origin of all modern humans but rejects the idea of substitution of populations (Trinkaus, 2005; Smith et al., 2005).

The 'Out of Africa' model espoused a traditional vision on *Homo neanderthalensis*, which were regarded as archaic, inferior and backward, both in morphological and cultural terms. This would facilitate their substitution by modern humans (Stringer and Gamble, 1993). Alternative perspectives have stressed the Neanderthal's ability to adapt and progress culturally (Zilhao, 2006, 2008; Pike et al., 2012; Hoffmann et al., 2018).

Current anthropological explanations reject the presence of *Homo neanderthalensis* in North Africa (Hublin, 1989, 2000, 2001; Straus, 2001; Hublin and McPherron, 2012; Hublin et al., 2017; Stringer, 2011, 2016).

However, *Homo neanderthalensis* are generally regarded to have inhabited the south of the Iberian Peninsula and to have born so-called

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Fig. 1. Location map with the sites mentioned in the text.

Mousterian technology (Vallespí, 1986; Finlayson, 2009; Finlayson et al., 2006, 2008; Barroso and Lumley, 2006; Cortés, 2007 a; 2007 b; Giles et al., 2012), Middle Palaeolithic (Tafelmaier et al., 2017), or Mode 3 (Clark, 1981; Ramos et al., 2014; Weniger and Ramos, 2014).

For north Africa, the general tendency is to consider that *Homo sapiens* (Hublin, 2001; Smith et al., 2007; Hublin et al., 2017) borne Middle Stone Age (MSA) technology (Bouzouggar, Barton, 2012; Linstädter et al., 2012; Collina-Girard, Bouzouggar, 2013; Scerri, 2013; Barton et al., 2016; Richter et al., 2017). Recently, however, the study of the North African Middle Stone Age (NAMS) has resulted in a more nuanced perspective of the period in this region (Scerri, 2017).

Within the framework of this historiographical context, we want to examine the stratigraphic sequence of Benzú (Ceuta), which was excavated by our team (University of Cádiz) (Ramos-Muñoz et al., 2013, 2014, 2016 a; 2016 b), and compare the results of this analysis with other sequences found in the South Iberian Peninsula, namely Gibraltar, level IV (Giles et al., 2012; Finlayson et al., 2006) and Bajondillo, levels Bj 19–14 (Cortés, 2007 a; 2007 b: 82).

In addition to the similarity of the lithic technology found in the northern and southern shores of the Strait of Gibraltar, we want to highlight that the exploitation of marine resources appears to have been very similar in South Iberia (Finlayson et al., 2006; Finlayson, 2008, 2009; Stringer et al., 2008; Zilhao et al., 2010; Colonese et al., 2011; Cortés et al., 2011), and North Africa, as shown by the evidence found in Benzú (Cantillo et al., 2010; Cantillo, 2015; Ramos-Muñoz et al., 2016 b), and other sites in the region, such as Ifri n'Ammar (Nami and Moser, 2010), Grotte de Pigeons, in Taforalt (D'Errico et al., 2009) and the caves in the region Rabat-Temara (Nespoulet et al., 2008 a; 2008 b; 2011; El Hajraoui et al., 2016; Campmas, 2017; Campmas et al., 2015, 2016; Chakroun et al., 2017).

Along with this similarities, we must stress that personal ornaments do not appear in the southern Iberian Peninsula before 50 Ky BP. On the other hand, the recent dating of red painted motifs found in Cueva de Ardales is of enormous interest (Hoffman et al., 2018).

2. Geographical and geological setting in northern Morocco

The concept of the 'geo-historical region' (Braudel, 1988) was ground-breaking: according to its principles, the southern part of the Iberian Peninsula and most of northern Morocco can be regarded as a single region (Vannee and Menanteau, 2004; Ramos-Muñoz, 2012). A geohistorical region can be defined as a region in which there is a dialectical and historical relationship between social groups, natural resources and modes of exploitation (Sanoja and Vargas, 1995). The Strait of Gibraltar is characterised by its hybrid Atlantic-Mediterranean nature (Arteaga and Hoffmann, 1999; Arteaga, 2002).

Significant, glacio-eustatic variations caused the African and European shores to move closer during the cold periods of the Pleistocene (Rodríguez-Vidal et al., 2004; Abad et al., 2013).

This movement facilitated contacts and the organised mobility of human groups during the Pleistocene. Therefore, the Strait of Gibraltar could be better understood as a 'bridge', rather than as a 'border' (Tarradell, 1959), at least during geologically regressive phases.

The geology of the area is related to its location in the southern sector of the Gibraltar Arc, which is characterised by the presence of the Gomáridides; these are a set of overlapping Alpine shift mantles (mainly Palaeozoic and, to a lesser extent, Mesozoic and Tertiary). The calcarious Dorsal is composed of limestone rocks from the Triassic and Liassic periods. To the west, Flysch areas including limestone and red marl, alternating with sandstone, may be found (Wildi, 1983; Domínguez-

Fig. 2. The Benzú stratigraphy and the reservoir chronologies.

Bella and Maate, eds., 2009).

This sequence is completed by significant Pleistocene Quaternary deposits such as Glacis, River terraces and Marine deposits that constitute evidence for eustatic oscillations in coastal areas (Rodríguez-Vidal et al., 2004; Rodríguez-Vidal and Caceres, 2005; Abad et al., 2007, 2013; Chamorro et al., 2011), as well as for cave deposits in caves and endorheic basins.

Recent studies have begun to analyse the river basins of the region, especially the Oueds Martil and Laou, on the Mediterranean side, and Oued Liane, Ksar-Seguir and Al Marsa in the area of the Strait of Gibraltar. Some of these studies have also examined the lower slopes of the hills of Anyera and the area of the Strait; these areas are rich in flint, radiolarites and quartz (Domínguez-Bella et al., 2006, 2013), which are the most frequent types of stone found in the archaeological deposits of Benzú (See Fig. 1).

3. Archaeological sites under analysis

The rock-shelter of Benzú is located in Ceuta, North Africa, set into a near-vertical dolostone outcrop (Fig. 2). Part of the shelter's ceiling has collapsed, and its remains are scattered over the site. Its present dimensions are 15.52×6.2 m. The south-easternmost end forms a small cave (Ramos et al., 2008a, 2014a; 2014b, 2016 a: 21). The excavation identified 10 strata, 7 of which provided evidence for human occupation. This evidence includes large numbers of worked stone, bone and shell. (Ramos et al., 2016 a: 21).

Concerning chronology, several dating techniques were applied. The dates recorded range between (OSL) Shfd 020135: 254 ± 17 ka-in stratum 2 and (Th/U) IGM: ± 70 ka-in stratum 10. In sum, the most recent episodes in the sedimentary and archaeological sequence can be dated to before 70,000 BP, whereas the record of the earliest human occupation of the rock-shelter stretches back approximately 250,000

years (Ramos et al., 2016 a; 21, 2017).

Studies conducted in the area suggest the recurrent occupation of the region. In our opinion, the central habitational site would have been located in the nearby Mogote de Benzá, and the rock-shelter of Benzá would have been used as a station in which to replenish hunting-tool stocks, process the hunted animals and, since it is close to the coast, collect marine fauna.

The Rock of Gibraltar is a limestone klippe peninsula located on the southern tip of Iberia. The region is historically significant: one of the first discoveries of *Homo neanderthalensis* skeletal remains was made in Forbes Quarry in 1848. Evidence for Mousterian occupation has also been attested in Devil's Tower. A number of caves in Gibraltar have been subject to excavation by several teams (Finlayson et al., 2006, 2008; 2014; Stringer et al., 2008; Giles et al., 2010, 2012; Shipton et al., 2013), and technological evidence for Neanderthal and Mousterian occupation has been attested in the Vanguard, Beefsteak and Ibex Caves as well as in Gorham's Cave.

Vanguard Cave is one of a series of caves on Governor's Beach, on the south-eastern side of Gibraltar (Shipton et al., 2013: 3); according to OSL, the site dates to between 118 and 121.6 ky (Rhodes, 2012).

Beefsteak Cave is located near Europa Point, on the southern tip of Gibraltar. The cave is probably marine in origin, with Lower Jurassic limestones. Karst cracks with mammal fossils and retouched artefacts have been attested there (Giles et al., 2007: 131). Uranium series dating of layer D, which overlies Middle Palaeolithic artefacts in layers C and B, has dated the deposit to 98.8 ± 15.5 ky (Giles et al., 2007: 132).

Ibex Cave is located high on the eastern side of Gibraltar, approximately halfway up The Rock. Tooth enamel from a layer underlying Mousterian artefacts was dated using Electron Spin Resonance to 37 ky or 49 Ky (Shipton et al., 2013: 4).

Gorham's Cave it is located on Governor's Beach, and in it was found a long occupation sequence. The latest excavations have identified a sequence of different layers. These layers correspond to a Late Upper Palaeolithic: Level III -Solutrean and Magdalenian-, and Level IV corresponding to a Mousterian techno-complex (Finlayson et al., 2006; Giles et al., 2012: 151; Shipton et al., 2013: 4). Gorham's Cave has presented an interesting series of dates: the levels that contain evidence for Mousterian occupation, which were identified by Waetcher in the central section of the cave in the 1950s (Waetcher, 1951; 1964), have been dated using various techniques: e.g. AMS: 47–49 Ky (Pettitt and Bailey, 2000) and ESR: 26–62 Ky (Volterra et al., 2000). More recent excavations, undertaken in the 1990s, have resulted in the following dates for Mousterian occupation: Radiocarbon: 40 to 50 ky (Pettitt and Bailey, 2000); ESR: 39.4–50.8 Ky (Rink et al., 2000). Recent dating tests have provided the following dates: 48–33 Ky (Higham et al., 2012) and OSL: 38.5–67.9 Ky (Rhodes, 2012).

Taphonomic and functional studies have been carried out by the research team which is currently working in Gibraltar. Each cave has its own signature of *Homo neanderthalensis* behaviour, permitting an assessment of spatial variation in the occupation of Gibraltar (Shipton et al., 2013: 3). Settlement patterns include recurrent habitation sites – Gorham's Cave – and sporadic occupation sites – Ibex Cave. Other sites were clearly used for hunting and the exploitation of marine species (Stringer et al., 2008; Finlayson et al., 2014; Fa et al., 2016).

Cueva Bajondillo is located in Torremolinos, in the western sector of the Bay of Malaga, between 10 and 20 m above sea level and roughly 250 m from the current coastline. Excavations have identified an important stratigraphic sequence, which is divided into 20 layers. The occupation of the site must have been almost continuous, and is one of the deepest stratigraphic sequences in the south of the Iberian Peninsula: it provides evidence for Middle and Late Palaeolithic occupation (Cortés, 2007 a, 2007 b, 2008, 2012; Cortés et al., 2011, 2011–2012, 2012). This work presents data from layers Bj19 to Bj14. Layer Bj19 has been dated to 150.3 ± 10 BP. Bj17 has been dated by TL to 64.5 ± 6.3 Ky. And Bj15 has been dated by various techniques to 39–35 Ky. (Cortés et al., 2011). The site was used for the gathering and

consumption of marine molluscs and mammals (aurochs, red deer, wild goats and rabbits) (Cortés et al., 2011: 2).

4. Methodology

In this paper, we aim to compare the lithic industry and marine resource assemblages found at different sites in the South Iberian Peninsula – including deposits from Gibraltar (Gorham's Cave, and Vanguard, Beefsteak and Ibex Caves) (Giles et al., 2010, 2012; Shipton et al., 2013; Finlayson et al., 2006, 2008, 2014), and Bajondillo (Cortés, 2007 a; 2007 b) – and Benzá (Ramos-Muñoz et al., 2008 a, 2013, 2014 a; 2014 b; 2016 a).

In the tables, data is provided on the type of raw materials used, their technological characteristics, the number of cores, flakes and retouched pieces, as well as remains of malacofauna and ichthyofauna.

This data is provided in order to evaluate the similarities between the assemblage found in Benzá and those found at Southern Iberian sites.

The deposits from Gibraltar and Bajondillo have been selected because they have been studied in detail, and well-defined Middle Palaeolithic, or Mousterian, assemblages have been found there, according to the excavators. The deposits from Gibraltar have been dated to between 150.3 and 33 Ky BP (Finlayson et al., 2006, 2014; Giles et al., 2010, 2012; Shipton et al., 2013).

Cueva de Bajondillo is located in Torremolinos, in the Bay of Malaga. The site presents a deep sequence from the Middle and Late Palaeolithic. Attention is focused on levels Bj/19 to Bj/14 (Cortés, 2007 b: 82 and ff.). The chronology of these levels, which are characterised by Mode 3 technology, is in the range 150–34 ky BP (Cortés, ed., 2007 a; Cortés et al., 2011). The technological assemblage has been defined by the excavators as Southern Iberian Middle Palaeolithic (Cortés, 2012).

The importance of these sites is mainly due to their stratigraphy, which matches lifestyles associated with Mode 3 technology and bone remains that are characteristic of *Homo neanderthalensis* groups.

The lithic industries and associated habits, not only in relation to hunting and gathering but also fishing and shell-fishing, are similar at all three sites.

We used the Logical-Analytical System proposed by Eudald Carbonell and his team. In this system, natural Bases are called nB; cores, 1GNB; flakes, PB; and retouched products, 2GNB. Other Knapping Products are referred to as OKP (Carbonell et al., 1995, 1999) in our examination. Retouched pieces have been analysed according to the rational and structural system (Laplace, 1972). Using this methodology we aimed to understand lithic industries within the framework of production, distribution and consumption processes.

Descriptive and analytical statistics (i.e. calculation of p-value and odds ratios [ORs]) were carried out with the assistance of SPSS- Windows 15.0 (SPSS Inc., Chicago, IL). Associations were measured using the appropriate statistical tests (Chi-squared [χ^2] and Fisher's exact test) based on contrasted variables and applicability conditions (Howell, 2011). ORs (Rudas, 2007) with 95% confidence intervals (CIs) were used as association measure in the determination of correlation between parameters (technology and decorative elements in sites located in North Africa and the southern Iberian Peninsula). The methods used were explained in the Caption to Table 5. A p-value < 0.05 was considered statistically significant.

Lithic technologies are thus examined in relation to the lifestyles of the communities and, as such, constitute a significant source of evidence for socio-economic analyses.

The study of marine fauna has been carried using a standard taxonomic methodology: we used the criteria of CLEMMAM (Check list of European marine molluscs) published by the Muséum National d'Histoire Naturelle (Paris), and we quantified the number of individual remains (IR) and minimum number of individuals (MNI). The methodology also involved taphonomic and microspatial analysis, in order

Table 1

Different types of raw materials, according to different categories of artifacts, in Mousterian and mode 3. Settlements on both sides of the Strait of Gibraltar (Giles et al., 2012; Ramos et al., 2013).

	Settlements	Technological Groups	Sandstone	Flint	Jaspe	Quartzite	Chert	Limestone
South of Iberia	Gorham's Cave	1GNB (Cores)	9 (75%)	–	–	1 (8,33%)	1 (8,33%)	1 (8,33%)
		PB (Flakes)	20 (32,26%)	36 (58,06%)	–	6 (9,68%)	–	–
		2GNB (Retouched)	3 (25%)	7 (58,33%)	–	2 (16,67%)	–	–
	Ibex Cave	1GNB (Cores)	–	–	–	–	2 (100%)	–
		PB (Flakes)	–	–	–	1 (100%)	–	–
		2GNB (Retouched)	–	6 (60%)	2 (20%)	2 (20%)	–	–
	Beefsteak Cave	1GNB (Cores)	–	–	–	–	2 (100%)	–
		PB (Flakes)	–	–	–	3 (33,33%)	6 (66,66%)	–
		2GNB (Retouched)	–	–	–	2 (20%)	8 (80%)	–
North Africa	Benzú Rockshelter	1GNB (Cores)	50 (64,1%)	28 (35,89%)	–	–	–	–
		PB (Flakes)	991 (72,92%)	367 (27,01%)	–	–	–	–
		2GNB (Retouched)	55 (53,93%)	47 (46,07%)	–	–	–	–

that we could ascertain the processes undergone by the marine fauna and thus increase our understanding of the presence of these remains in the relevant contexts.

5. Results of the comparison of lithic technology

5.1. Raw materials

The exploitation of raw materials at the sites under analysis is highly significant.

Various materials suitable for knapping are available in Gibraltar, including the limestone from which The Rock is formed (which is of low quality in terms of acting as a raw material for stone tools). There is also a quartzite outcrop on the western flank of The Rock, and primary sources of quartzitic sandstone exist within 10 km of Gibraltar. Other types documented include red chert and green chert (Shipton et al., 2013: 2). In general, therefore, recent studies suggest that the four types of stone available in Gibraltar are local limestone, local quartzite, local chert and imported chert (Shipton et al., 2013: 3).

In Gorham's Cave, the material should be viewed in the context of its location in the Baetic-Rif Arc (Giles Pacheco et al., 2010, 2012: 152; Shipton et al., 2013: 4). Most of the material was produced using flint or sandstone. Flint is not present among the specimens of 1GNB-Cores, but it is found among Other Knapping Products (OKP), as well as among natural Bases (nB.).

OKP from sandstone predominate, and they may be related to the production of flakes. Flint flakes may be related to the production of cutting edges. There is no significant difference between knapping products and retouched pieces in terms of raw materials (Giles Pacheco et al., 2012: 153).

In Vanguard's Cave, stone tools of chert, limestone and quartzite have been found (Shipton et al., 2013: 3). The small number of stone tools found in Beefsteak Cave include tools made from quartzite and chert (Shipton et al., 2013: 3–4).

In levels Bj/19 to Bj/14 of Bajondillo, flint is predominant among all technological groups. Quartzes are found in small quantities. Flint is especially predominant among retouched pieces. A petrological- and stone-catchment analysis is currently being undertaken (Cortés, ed., 2007 b: 83).

Concerning Benzú, (Domínguez-Bella et al., 2006, 2013; Ramos-Muñoz et al., 2016 a), the most common raw materials are sandstones, flint, and flint variants, such as radiolarite. Most of the stones used are local, and can be found within 10 km of the site. The vicinity of the site is strewn with pebbles, which were intensively exploited. The percentage of lithic items from sandstone is higher here than at Gorham's Cave. In Benzú, radiolarite and flint flakes were used more often in the production of retouched pieces. Non-retouched PB-flakes were, preferentially, knapped from the good-quality sandstone that abounds in the area.

The model of exploitation of raw materials in Benzú, especially in levels 5–7 is similar to that attested in the Southern Iberian communities. Volume indexes are also similar. Although raw material can be found in abundance, 1GNB-Cores were used intensively until their size was much reduced, and only abandoned after the PB-flakes had become too small.

5.2. Lithic technology

The lithic technology recorded at the two sites in Southern Iberia is very similar. Centripetal knapping is predominant, with disc-shaped and Levallois cores notable (Mora et al., 1992; Boëda, 1994; Carbonell et al., 1992, 1995, 1999), each of which techniques was used for the production of different tools. While centripetal knapping was used to extract a large number of PB-flakes, the Levallois technique was used in the production of a specific flake shape. In this article, centripetal and Levallois cores have been aggregated to form a single category (Shipton et al., 2013: 8) (see Table 1).

We present a synthesis of the 7 layers of Benzú (Ramos et al., 2013: 348–356), including a total of 3243 stone products, not including knapping waste. The total includes 219 cores, 2267 Levallois flakes, 343 side-scrapers, 396 denticulated pieces and 18 points. Table 2 breaks down the number of cores, Levallois flakes, side-scrapers, denticulated pieces and points per stratigraphic layer (See Figs. 3 and 4).

Evidence for technological practice at the other sites under consideration in southern Iberia is available in published form: Bajondillo layers 14 to 19 (Cortés, 2007 a; 2007 b), Beefsteak Cave (Giles et al., 2007), Vanguard Cave (Shipton et al., 2013: 3), Gorham's Cave (Giles et al., 2012; Shipton et al., 2013: 4 and ff).

In Table 2 the differences in percentages from both sites have been noted. It should be taken into account that the total volume of material found at each site is very different; this is related to the high concentration of internal flakes and the low number of Levallois flakes attested in Benzú.

It is clear that flakes of specific shapes (which could be used as tools without further retouching) were sought after, whilst the remaining flakes were retouched in order to produce other kinds of tools. In Benzú the refreshing of cutting edges with side-scrapers (Clemente, 2013) has also been attested, and this is a practice which has also been identified in the other sites under consideration.

Laminar flakes were found only in small numbers at the sites under consideration – 17 laminar flakes in Benzú. Mid-sized flakes with ample, multi-functional edges predominate (Ramos et al., 2013).

As previously noted, in Benzú there are few laminar flakes among the PB, and none among the 2GNB-retouched pieces; thus, it seems that large- and middle-size flakes were preferred (Bagolini, 1968).

Data from four sites in Gibraltar have been revised; their chronologies are, in some cases, very similar to that of Benzú, especially that of Vanguard's Cave and Beefsteak Cave (whose chronology coincides

Table 2
Different types of Musterrian and mode 3. Characteristic artifacts in Pleistocene deposits on the both sides of the Strait of Gibraltar (Giles et al., 2012; Ramos et al., 2013). Cores: 1GNB. Centripetals and Levallois Cores
1GNB-MC & L. Flakes: PB. PL. Production Levallois. AL: Débitage Levallois (Cortés, 2008: 107). Retouched products: 2GNB. 2GNB-R-E: Side-Scrapers. 2GNB-D: Denticulates and notches. 2GNB-P: Points. The table
contains the quantity of the technological type presented; the quantity of all the products, for example, cores, flakes and the percentage.

Settlements	1GNB-MC & L			PB-LE			PL			AL			2GNB-R			2GNB-D			2GNB-P			2GNB		
	Cores MC & L			Levallois Flakes			Production Levallois			Debitage Levallois			Scrapers			Encouchees			Points			Retouched		
	Nº	T	%	Nº	T	%	Nº	T	%	Nº	T	%	Nº	T	%	Nº	T	%	Nº	T	%	Nº	T	%
South of Iberia	Gorham's Cave, Lvl. 4	2	12	17	52	62	83,7	-	-	-	-	-	4	33,33	2	17	-	-	-	-	-	-	12	-
	Vanguard's cave	2	6	33,33	2	72	2,67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Beefsteak. Lvl. C & B	-	-	-	1	1	100	-	-	-	-	-	1	10	2	20	-	-	-	-	-	-	10	-
	Ibex	3	3	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bajondillo. Bj 18- Bj 19	-	-	-	-	-	-	-	-	1,50	-	-	2	25,00	-	-	-	-	-	-	-	-	8	-
	Bajondillo. Bj 17	-	-	-	-	-	-	-	-	22,20	-	-	85	10,75	20	2,53	-	-	-	-	-	5	0,63	791
	Bajondillo. Bj 16	-	-	-	-	-	-	-	-	24,60	-	-	35	15,35	4	1,75	-	-	-	-	-	8	3,51	228
	Bajondillo. Bj 15	-	-	-	-	-	-	-	-	16,90	-	-	66	10,73	48	7,80	-	-	-	-	-	-	-	615
	Bajondillo. Bj 14	-	-	-	-	-	-	-	-	12,20	-	-	15	7,01	33	15,42	1	0,47	-	-	-	1	0,47	214
	Benzú. Lvl 7	38	101	37,63	270	1589	16,99	-	-	-	-	-	51	28,18	126	69,91	2	1,1	-	-	-	2	1,1	181
North Africa	Benzú. Lvl 6	8	38	21,05	290	1108	26,17	-	-	-	-	-	-	-	39	68,42	-	-	-	-	-	-	57	-
	Benzú. Lvl 5	60	126	47,62	544	2987	18,21	-	-	-	-	96	52,75	79	43,41	5	2,75	-	-	-	5	2,75	182	-
	Benzú. Lvl 4	65	129	50,39	640	3525	18,16	-	-	-	-	112	59,26	68	35,98	8	4,23	-	-	-	8	4,23	189	-
	Benzú. Lvl 3	21	48	43,75	208	1174	17,72	-	-	-	-	43	53,09	34	41,98	3	3,7	-	-	-	3	3,7	81	-
	Benzú. Lvl 2	12	38	31,58	223	934	23,88	-	-	-	-	15	31,25	33	68,75	-	-	-	-	-	-	-	48	-
	Benzú. Lvl 1	15	43	34,88	92	331	27,79	-	-	-	-	8	32	17	68	-	-	-	-	-	-	-	25	-

with the central strata in Benzú; Shipton et al., 2013: 3–4). Gorham's Cave and Ibex Cave are more recent, but the lithic industry found at these sites is very similar to that found on other sites with older chronologies both in southern Iberia (Cortés et al., 2007a,b) and North Africa (Ramos et al., 2013).

The central part of the sequence in Vanguard's Cave presents three well-defined occupation horizons related to Middle Palaeolithic industrial assemblages, especially centripetal and Levallois cores and Levallois flakes (Shipton et al., 2013).

In Beefsteak Cave (Giles et al., 2007) there was a small number of stone products (Table 2), most of which are retouched products, including a scraper and two denticulated pieces (but no retouched points). The site has yielded two cores and one Levallois flake (Shipton et al., 2013: 3–4).

The Ibex Cave has also yielded some worked stone specimens; the most remarkable of which are three centripetal cores.

A substantial proportion of the stone products found in Gorham's Cave point towards the Levallois technique: 83.7% of the flakes found at the site present ridges on the dorsal face, which suggests that Levallois/centripetal knapping was practised (Giles Pacheco et al., 2012: 155–156; Shipton et al., 2013: 8).

In Bajondillo, the situation is similar; the levels dating to the Middle Palaeolithic contain Levallois and disc-shaped cores (Boeda, 1994), which were produced systematically (Cortés et al., 2007 a; 2007 b). The proportion of laminar flakes in Bajondillo is very low: Bj/17: 2.8%, Bj 16: 2.6%, Bj/15: 3.5%, Bj 14: 6.2% (Cortés, 2007 b: 86).

Data pertaining to levallois production (PL) and débitage (AL) in Bajondillo are of interest: these finds constitute between 12 and 23% of the entire assemblage (Cortés, 2007 a: 176; Cortés, 2007 b: 82; 2008: 107).

The assemblage includes centripetal cores and Levallois cores; the Levallois chaîne opératoire is well represented at this site (Cortés, 2007 a: 176, 2007 b: 82; 2008).

Regarding 2GNB-retouched pieces (Table 2), in Gorham's Cave the proportion of side-scrapers and denticulated pieces is similar, with the most common techniques being continuous simple retouching for side-scrapers and successions of notches for denticulated pieces. Denticulations are not particularly pronounced (Giles Pacheco et al., 2012: 158–159; Shipton et al., 2013: 4).

A similar pattern of retouching is attested in Benzú, where side-scrapers are deep but do not penetrate the piece excessively; notches and denticulation are also shallow (Ramos-Muñoz et al., 2016 a).

The pieces which constitute the assemblage in Gorham's Cave are lacking in points, but there is one point-shaped side-scraper (Giles Pacheco et al., 2012: 158–159; Shipton et al., 2013: 4).

In Benzú, although several pieces that can be typologically defined as points have been attested, functional analyses indicate that they were used as side-scrapers and not as projectiles (Clemente, 2013).

In levels Bj14 and Bj 17 at Bajondillo, the percentage of side-scrapers ranges between 16% and 53% (Cortés, 2007 a: 177; 2007 b: 93), and the number of notched and denticulated pieces is also significant (Table 2).

Bajondillo is a well-known site. Technologically, it presents strong parallels with Benzú, especialmente en levels 5 a 7, in terms of the production of Levallois products, side-scrapers and points.

6. Results of the comparison of marine faunal evidence

There is increasing evidence for fishing and shellfish-gathering activities in relation to Mode 3 archaeological contexts on both shores of the historical region of the Strait of Gibraltar (Table 3).

On the southern shore, excavations in Benzú have documented the presence of marine molluscs in all occupation levels (from 7 to 1) and remains of fish (Sparidae) vertebrae in level 5. In level 5 there is a greater quantity of marine fauna (MNI = 29) (Cantillo, 2015; Ramos-Muñoz et al., 2011, 2016). This suggests that sea resources were an

Fig. 3. Lithic technology. Benzú Rockshelter. 1A, 1B, 2A y 2B BN1G-Cores-CM. Centripetal. Levels 5 and 6. 3. PB-Flakes-LE- Levallois. Level 5. 4. BN2G-Retouched products -D21. Levels 5. 6 and 7. BN2G- Retouched products- R21 y R23-Side-Scrapers. Levels 5 and 6. (Barrena, 2017).

important food source, and seafood would have complemented terrestrial sources. Especially significant are the limpets, in particular the species *Patella vulgata*, of which a number of very large specimens have been noted. Levels 4 and 5 are remarkably rich in shellfish and terrestrial fauna (especially Bovidae), suggesting the presence of a spoil midden (Cantillo, 2013). Concerning fish, the vertebrae correspond to Sparidae, and some of the specimens are articulated (Cantillo, 2015).

From a taphonomic perspective, levels 4 and 5 are rich in mollusc remains, terrestrial fauna (some of these remains are broken and burnt) and stone artefacts, which suggests that the assemblage is the result of deliberate deposition, and can be interpreted as a spoil midden (Cantillo, 2013) near a hearth.

Also important was the discovery of perforated *Nassarius* shells at several Middle Palaeolithic sites (in association with Aterian technology) in the region: for instance, Ifri n'Amar Cave (Plaine de Guerouaou, Eastern Rif, Morocco) or Grotte de Pigeons (Taforalt, Morocco) (Nami and Moser, 2010: 41; Bouzzougar et al., 2007; D'Errico et al., 2009). Sometimes, these shells have remains of red ochre, which suggests that these societies were capable of significant social progress.

Marine remains are commonly attested among hunter-gatherer groups with Aterian technology in the sites found around Rabat (Campmas, 2017; Campmas et al., 2015, 2016; Chakroum et al., 2017; Nouet et al., 2015). The most common species in these sites are intertidal rock-dwelling species (Chakroum et al., 2017), like in the rock shelter of Benzú.

On the northern shore of the Strait, the excavation of some levels in

the Vanguard Cave (Gibraltar), which are clearly associated with *Homo neanderthalensis* remains and Mousterian technology, has resulted in the discovery of evidence for the collection and consumption of marine remains, chiefly *Mytilus galloprovincialis* (Stringer et al., 2008). Especially interesting is the evidence which suggests that heat was used to open molluscs, as well as cutmarks on the remains of marine mammals such as *Monachus monachus*, which suggests that this species was also used as a food source (Stringer et al., 2008). The excavation of level IV at Gorham's Cave has resulted in the discovery of up to 14 different species of marine molluscs, and we should note especially the gastropods *Mytilus* sp. (MNI = 5) and *Patella* sp. (MNI = 11), which were gathered to be consumed as food (Fa et al., 2016). Again, as was the case in the Vanguard Cave, the inhabitants of Gorham's Cave also ate seals (*Monachus monachus* and *Halichoerus grypus*) (Erlandson and Moss, 2001).

At Bajondillo, the evidence confirms the exploitation of marine resources in association with Neanderthal remains approximately 150 ky BP. Nine categories of marine invertebrates have been identified, and *Mytilus galloprovincialis* was the predominant species. The presence of bivalves (*Glycymeris* sp., *Tracia* sp., *Donacilla cornea* and *Glycymeris Panopea*), the barnacle *Balanus trigonus* and the gastropod *Stramonita haemastoma* should also be noted. Based on current habitats, it seems likely that these molluscs were collected at low tide in rocky and sandy coastal areas (Cortés et al., 2011: 2). In addition, the evidence of burning found on some mollusc shells, the clear selection of certain species, and the fracture patterns all indicate that the accumulation of

Fig. 4. Examples of documented marine remains in settlements of Benzú Rockshelter, Gibraltar cave and Bajondillo cave. 1 and 3. *Patella vulgata*. Benzú Rockshelter (Cantillo, 2015); 2. *Siphonaria pectinata*. Benzú Rockshelter (Cantillo, 2015); 4. Bone with cut marks of *Monachus monachus*. Vanguard Cave (Stringer et al., 2008); 5. *Melanopsis laevigata*. Bajondillo cave (Cortés et al., 2011). 6. *Donacilla cornea*. Bajondillo cave (Cortés et al., 2011); 7-9. *Mytilus galloprovincialis*. Bajondillo cave (Cortés et al., 2011).

remains in the cave is the product of human action (Cortés et al., 2011: 4).

The evidence suggests that mollusc-collection practices were similar on both shores. This collecting mostly took place in rocky areas that were submerged for long periods and were relatively sheltered from the surf. The presence of such areas near the caves was a determinant factor in the development of gathering- and consumption strategies. Other species such as dolphins, seals and whales would likely have been slaughtered after becoming beached, and fish would likely have been captured during spawning.

In this article, we have presented taphonomic theories and data on the use of marine resources. All the sites described, on both shores of the Strait of Gibraltar, present evidence for similar mollusc-collection strategies; there seems to have been a preference for *Mytilus* and/or *Patella*, i.e. species that inhabit identical coastal environments (environments which are easily accessible when the tide is out). This would explain the continued use of marine resources in coastal locations around the Strait of Gibraltar since at least the Middle and Upper Pleistocene.

7. Discussion

7.1. Similarities and differences in the record for human activity dated to MIS 5–3 in the strait of Gibraltar

A comparison of the archaeological records from different sites in the geo-historical region of the Strait of Gibraltar has revealed substantial similarities and differences between the northern and southern shores, for chronologies within 150 and 70 Ky BP. (Cortés, 2007 a, 2007 b, 2012; Giles et al., 2007, 2010, 2012; Shipton et al., 2013; Ramos-Muñoz et al., eds., 2013; Ramos-Muñoz et al., 2014, 2014 a, 2014 b, 2016 a, 2016 b; Barrena-Tocino, 2018):

- Similarities in raw materials, which were mostly locally sourced.
- Similarities in knapping technologies, concerning nearly all technological categories: 1GNB-Cores, predominantly centripetal and Levallois; PB-flakes, produced by means of the Levallois technique and present numerous ridges and faceted butts.
- Scarce presence of laminar flakes.

Table 3

Marine fauna documented in Mousterian levels of North Africa and South of the Iberian Peninsula (Cantillo, 2015; Fa et al., 2016; Stringer et al., 2008; Colonese et al., 2011; Erlandson and Moss, 2001; Cortés et al., 2011).

Taxones	Benzú Rockshelter (levels 1–7)	Gorham's Cave (level IV)	Bajondillo (level 17–19)
Gastropods			
<i>Fissurella</i> sp.		1	
<i>Littorina obtusata</i>		2	
<i>Littorina saxatilis</i>		1	
<i>Nucella lapillis</i>		1	
<i>Patella caerulea</i>	2	1	
<i>Patella depressa</i>		1	
<i>Patella ferruginea</i>	1		
<i>Patella</i> sp.		11	
<i>Patella vulgata</i>	58	6	
<i>Phorcus turbinatus</i>		1	
<i>Siphonaria pectinata</i>	2		
<i>Stramonita haemastoma</i>			1
<i>Trochidae</i>		1	
Bivalves			
<i>Acanthocardia tuberculata</i>			1
<i>Callista chione</i>			1
<i>Donacilla cornea</i>			1
<i>Glycymeris</i> sp.			3
<i>Mytilus</i> sp.		5	
<i>Mytilus galloprovincialis</i>			42
<i>Panopea glycymeris</i>			1
<i>Pecten</i> sp.		2	
<i>Pecten maximus</i>		2	
<i>Ruditapes decussatus</i>	1		
<i>Thracia?</i> sp.			1
<i>Veneridae</i>		3	
Crustaceans			
<i>Balanus trigonus</i>			2
<i>Balanus</i> sp.			7
Marine mammals and fishes			
<i>Halichoerus grypus</i>		¿	
<i>Monachus monachus</i>		¿	
<i>Sparus aurata?</i>	1		

- Among retouched pieces, BN2G-R-side-scrapers and D-notches and denticulation clearly predominant. No hand axes are documented in the levels under consideration.
- In Southern Iberia, this technology is dated within MIS 5 and MIS 3 chronological contexts, which corresponds to typical Mousterian technologies (Vallespi, 1986; Cortés, 2012; Giles et al., 2007, 2010; 2012; Shipton et al., 2013).
- A comparison with the technology attested in other sites in the region, such as Zafarraya (Barroso and Lumley, 2006), Ardales (Ramos-Muñoz et al., eds., 2014) and Sima de las Palomas (Medianero et al., 2011; Weniger and Ramos-Muñoz, eds., 2014) yields similar results. It should be taken into consideration that these sites are located far from the coast, and that they were used as hunting sites by *Homo neanderthalensis* groups. At these sites, the most abundant items are Mousterian points and side-scrapers. A recent study in Sima de las Palomas has confirmed two well-defined activities: butchering and woodworking. The site can thus be interpreted as a domestic and hunting site in which food and other products and goods were processed (Clemente, 2014).
- Similarity in the strategies used to gather malacofauna.

Significant differences have also been attested.

Ochre, beads and bone tools are 5 times more likely to be found in North African sites related to Aterian-M.S.A. technology than in the southern Iberian Peninsula, while bifacial foliates are 8.56 times more likely and blades 3.75 times more likely (Tables 4 and 5).

On the other hand, although the descriptive analysis (Table 4) reveals the presence of retouched points and centripetal and levallois

1GNB-Cores -a technology which is characteristic of the *Homo neanderthalensis* and the *Homo sapiens sapiens*-both in North Africa and in Southern Iberia, the hypothesis contrast test (χ^2) seems to indicate that this technology is statistically more significant in North Africa ($p = 0.018$; Table 5). Overall, technologies characteristic of the *Homo sapiens* (Ochre, Beads, Bone tools, Grind stone, 1GNB-Cores centripetal and levallois, Bifacial foliate, Blade, Ret. Points and Other Ret.) are statistically more significant in North Africa ($p = 0.007$; Table 5).

The current conditions of the archaeological record must be taken into consideration. There are no archaeological sites dated to between 300 and 160 Ky BP in the southern Iberian Peninsula. Should we find contexts with these chronologies, our understanding of the similarities and differences between the archaeological records on both shores of the Strait of Gibraltar would improve immensely.

7.2. *Homo sapiens sapiens* in North Africa, and *Homo neanderthalensis* in Iberia

MSA technological assemblages found in South Africa are associated with *Homo sapiens sapiens* groups (Marean et al., 2007; McBrearty and Stringer, 2007; Jacobs et al., 2008), which were characterised by modern behaviours: artistic expression, personal adornments, bone tools, fishing and shellfish gathering, use of ochre, painting tools, etc. Technologically, these assemblages are characterised by the abundant presence of laminar flakes and foliate pieces (McBrearty and Brooks, 2000; D'Errico et al., 2005; Conard and Delanges, eds., 2010).

Traditionally, scholars working in the Maghreb have used the terms 'Mousterian' and 'Aterian' to refer to Middle Palaeolithic cultures (Caton-Thompson, 1946; Bordes, 1976–1977; Pericot and Tarradell, 1962; Aumassip, 2001; Wengler, 1997; Garcea, 2004; Otte, 2011, 2013; Otte et al., 2004; Linstädter et al., 2012). Garcea's (2004) suggestion that Aterian technology may have originated in the Sahara is of great interest. This idea has been recently related to the improvement of climatic conditions, which allowed for the arrival of population groups from the south (Linstädter et al., 2012: 172). Recently, there has been a tendency to refer to these industries as typical of the MSA (Barton et al., 2016; Bouzouggar et al., 2016; Doerschner et al., 2016; Scerri, 2017).

At the same time, groups of *Homo neanderthalensis* are attested in Southern Iberia (Lumley, 1998: 131; Arsuga et al., 2001; Garralda, 2005–2006; Barroso and Lumley ed., 2006; Walker et al., 2008, 2011; Finlayson et al., 2008; Finlayson, 2009; Zilhao et al., 2010; Baena et al., 2014), and for some time their presence in North Africa was also considered a possibility (Enouchi, 1962) although currently the human groups in the region are characterised as *Homo sapiens sapiens* (Hublin, 1989; Debénath, 2001; Zouak, 2001: 154, 2007; Scerri, 2017). As such, the North African Mousterian and Aterian industries are considered to be the work of modern humans (Zouak, 2001: 155, 2007; Linstädter et al., 2012; El Hajraoui et al., 2016; Garcea, 2004; Barton et al., 2008; Bouzouggar and Barton, 2012; Dibble et al., 2013; Groucutt et al., 2015; Will et al., 2015; Barrena-Tocino, 2015; Scerri, 2017).

These industries, which are variously referred to as Mode 3, Mousterian or MSA, in the Maghreb are dated prior to 300 ky B.P (Richter et al., 2017; Bouzouggar et al., 2016; Ramos-Muñoz et al., 2016 a, 2016 b). This situation stands in sharp contrast to the more recent chronologies from Southern Iberia (Finlayson et al., 2006; Wood et al., 2013; Shipton et al., 2013).

However, the similarity and differences between Mode 3 technology, as attested in Southern Iberia (Barroso, De Lumley, 2006; Finlayson et al., 2006; Cortés et al., 2011, 2011–2012: 77; Torre et al., 2013; Shipton et al., 2013; Bernal Gómez, 2015; Barrena-Tocino, 2015), and that recorded in Benzú, which is regarded as North African MSA-Mode 3, should be taken into consideration (Ramos-Muñoz et al., eds., 2013; Ramos-Muñoz et al., 2016 a).

Table 4

Similarities and differences in the archaeological record between populations of the Upper Pleistocene N. Africa and S. Iberia (Giles et al., 2012; Linstädter et al., 2012; Ramos et al., 2013; Bouzouggar et al., 2016; El Hajraoui et al., 2016; Scerri, 2017).

	Settlements	Cronology	Ochre	Beads	Bone Tools	Grind-stone	1GNB-MC/L MC/L Cores	Bifacial foliate	Blade	Ret. Point	Other Ret.
North Africa	Jebel Irhoud	~ 300 Ky	No	No	No	No	Yes	No	Yes	Yes	Yes
	Benzú Rokshelter	~ 270-70 Ky	No	No	No	No	Yes	No	Yes	Yes	Yes
	Ifri n'Ammar. Lower OI	~ 171 ± 12 Ky	No	No	No	No	Yes	No	Yes	Yes	Yes
	Contrebandiers 6c	~ 122,3 ± 4,5 Ky	No	No	No	No	Yes	No	No	No	Yes
	El Mnasra. Level 7b	~ 109 Ky	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	Rhafas 3	< 100 Ky	No	No	No	No	Yes	No	No	Yes	Yes
	Taforalt. Unit E	~ 82 Ky	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
	El Harhoura 2. Level 3	~ 60 Ky	No	No	Yes	No	Yes	Yes	Yes	No	Yes
South of Iberia	Gorham's Cave	~ 48-33 Ky	No	No	No	No	Yes	No	Yes	No	Yes
	Vanguard's Cave	~ 118–121.6 Ky	No	No	No	No	Yes	No	No	No?	Yes
	Beefsteak Cave	~ 98.8 ± 15.5 Ky	No	No	No	No	Yes	No	No	No	Yes
	Ibex cave	~ 37–49 Ky	No	No	No	No	Yes	No	No	No	No
	Bajondillo	~ 150-35 Ky	No	No	No	No	Yes	No	Yes	?	Yes

Table 5

Similarities and differences in the archaeological record between populations or the Upper Pleistocene human groups in N. Africa and S. Iberia: Analytical statistics.

Technology and personal ornaments	North Africa ^a (%)	South of Iberia (%)	OR (95% CIs)	p-value
Ochre ^b				
Presence	2 (16.66)	0 (0)	5.00 (0.19–130.03)	0.470 ^c
Absence	5 (41.66)	5 (41.66)		
Beads ^b				
Presence	2 (16.67)	0 (0)	5.00 (0.19–130.03)	0.470 ^c
Absence	5 (41.67)	5 (41.67)		
Bone tools ^b				
Presence	2 (16.67)	0 (0)	5.00 (0.19–130.03)	0.470 ^c
Absence	5 (41.67)	5 (41.67)		
Grind-stone ^b				
Presence	0 (0)	0 (0)	0.73 (0.01–43.01)	1.00 ^c
Absence	7 (58.33)	5 (41.66)		
1GNB-MC/L ^{b,d}				
Presence	7 (58.33)	5 (41.66)	1.36 (0.02–79.97)	1.00 ^c
Absence	0 (0)	0 (0)		
Bifacial foliate ^b				
Presence	3 (25)	0 (0)	8.56 (0.34–212.95)	0.204 ^c
Absence	4 (33.33)	5 (41.66)		
Blade ^b				
Presence	5 (41.66)	2 (16.66)	3.75 (0.33–42.47)	0.558 ^c
Absence	2 (16.66)	3 (25)		
Ret. Point ^{b,d}				
Presence	5 (41.66)	1 (8.33)	10.00 (0.65–154.40)	0.242 ^c
Absence	2 (16.66)	4 (33.33)		
Other Ret. ^b				
Presence	7 (58.33)	4 (33.33)	5.00 (0.17–150.93)	0.417 ^c
Absence	0 (0)	1 (8.33)		
1GNB-MC/L + Ret. Point				
Presence	12 (42.85)	6 (21.42)	8.00 (1.28–50.04)	0.018 ^{e,*}
Absence	2 (7.14)	8 (28.57)		
<i>Homo sapiens</i>				
Presence	33 (30.55)	12 (11.11)	3.02 (1.32–6.90)	0.007 ^{e,*}
Absence	30 (27.77)	33 (30.55)		

*p < 0.05.

Abbreviations: OR, odds ratio; CI, confidence intervals; Ret, retouched.

^a Jebel Irhoud settlement was excluded from the statistical analysis.

^b *Homo sapiens* technology and personal ornaments.

^c Fisher's exact test.

^d *Homo neanderthalensis* technology.

^e χ^2 test.

7.3. Hypothesis on these similarities

The following scenarios will be discussed in an attempt to explain the similarities and differences in the record:

- 1 Mobility and interaction in the region around the Strait of Gibraltar
- 2 Migration around the Mediterranean, exiting Africa through the Middle East
- 3 Cultural convergence.

1. In the first scenario, technological similarities are due to ongoing social and cultural interaction, facilitated by the high level of mobility that characterises hunter-gatherer groups (Weniger, 1991; Estévez et al., 1998; Otte, 2011, 2013). Similar lifestyles are also attested (Arteaga et al., 1998; Ramos-Muñoz, 1999), as suggested by the use of marine resources during the Upper Pleistocene on both shores of the Strait of Gibraltar (Finlayson, 2009; Zilhao et al., 2010; Colonese et al., 2011; Cortés et al., 2011; Ramos-Muñoz et al., 2011; Ramos-Muñoz, and Cantillo, 2011; Cantillo, 2012).

2. In the second scenario, the similarities are explained by the arrival of *Homo sapiens sapiens* groups to North Africa. These groups developed Mode 3-MSA technology, but did not cross the Strait (Tafelmaier et al., 2017). They would, however, have migrated around the Mediterranean (Straus, 2001, 2012). This hypothesis has been applied to different stages of the Pleistocene (Gamble, 1999; Aguirre and Carbonell, 2001; Stewart and Stringer, 2012; D'Errico and Stringer, 2011; Reyes-Centeno et al., 2015).

3. The third scenario is framed by the concept of 'cultural convergence', which should be understood as the dynamic process by which two or more social groups independently acquire similar ways of life, traditions or knowledge – that is, the emergence of similar inventions in similar (or different) environmental contexts without these groups interacting. The result of these processes is a tendency towards cultural uniformity. Some examples of cultural convergence can be found among *Homo neanderthalensis*: for example, the development of the Levallois or Victoria West technique (Lycett, 2009, 2011; Lycett, and Metin, 2013). This hypothesis has been used, for example, to deny the possible relationship between European Solutrean points and Clovis points (Straus, 2000, 220; Straus et al., 2005; Lycett, 2009; Lycett, 2011). It is argued that the manufacture of lithic tools is a reductive process and that, therefore, the number of possible outcomes in terms of shape becomes increasingly constrained (Lycett and Metin, 2013).

Despite the physical differences between *Homo neanderthalensis* in Europe and *Homo sapiens sapiens* in North Africa, the technological and economic similarities must be viewed in terms of one of the three scenarios presented in the previous section. Currently, we support the first scenario.

The cultural and technological similarities, which also suggest similar lifestyles, are of enormous interest. We posit here that enough evidence exists to argue for frequent contacts, common models for the production of cores, flakes and some retouched products (side-scrapers, points, notches, denticulated products), as well as similar hunting, shellfish-gathering and fishing practices, over many millennia. In our opinion, therefore, the technological parallels found on either side of the Strait of Gibraltar are indications of similar lifestyles.

Chronologies are higher in North Africa, and it is likely that technical innovations came from the south. The Strait of Gibraltar was not an insurmountable obstacle to the mobility of human groups during the Middle and Upper Pleistocene (Ramos-Muñoz, 2012; Otte, 2011, 2013).

8. Conclusions

On the basis of current research, it is believed that Late Pleistocene –OIS 5 to 3 correspond to *Homo sapiens sapiens* in North Africa and to *Homo neanderthalensis* in Iberia.

The records are dated to 300–70 Ky in North Africa (Hublin et al., 2017; Scerri, 2017; Tafelmaier et al., 2017) and 150–33 ky in Southern Iberia (Cortés et al., 2011; Wood et al., 2013; Shipton et al., 2013) (Table 4). It must be taken into consideration that no archaeological records dated to between 300 and 160 Ky BP have been found in southern Iberia (Cortés, 2008, 2012; Baena et al., 2014; Weniger and Ramos, Eds., 2014).

Stone technology on both shores share some interesting features, and this paper has compared technical data – types of core, flakes, retouched products – from relevant sites on the coasts of North Africa (Benzú) and South Iberia (Gibraltar and Bajondillo).

It is generally accepted that the low presence of laminar flakes is a characteristic of most Middle Palaeolithic assemblages of OIS5–OIS3 in Europe. Similarly, denticulates and notches as well as side-scrapers are the most common features of many Middle Palaeolithic assemblages, regardless of their location, in Europe (Otte, 1996; Carbonell and Vaquero, 1996; Gamble, 1999: 225 and ff; Straus, 2001: 94 and ff; Roebroeks, 2008; Conard, and Delagnes, 2010; Straus, 2012a,b), the Near East (Bosinski, 1999: 55 and ff; Pastoors et al., 2008) and North Africa (Nespoulet et al., 2008a, 2008 b; Linstädter et al., 2012; Hublin et al., 2017; Scerri, 2017).

In addition to these similarities in stone technology, the record on both shores suggests that, during the relevant periods, groups on both shores followed similar strategies for the exploitation of marine resources (Cortés et al., 2011; Ramos et al., 2011; Ramos-Muñoz et al., 2011; Ramos and Cantillo, 2011; Romagnoli et al., 2017). In addition, in Southern Iberia there is a significant difference between coastal and inland sites; the former were used for the exploitation of marine resources whereas the latter were related to hunting activities (Barroso and Lumley, 2006; Medianero et al., 2011; Ramos-Muñoz et al., eds., 2014; Weniger and Ramos-Muñoz, eds., 2014).

At any rate, we think that the issue is far from being closed, and that more research is needed to validate or reject our hypothesis.

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