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Marine resources exploitation by Palaeolithic hunter-fisher-gatherers and Neolithic tribal societies in the historical region of the Strait of Gibraltar

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ABSTRACT

The Strait of Gibraltar is a geographic region between the south of Europe and the north of Africa. On the basis of the geological, geographical and ecological evidence, this is considered a historical region. Prehistoric societies that lived during the Pleistocene and Holocene on both sides of the Strait left behind very similar archaeological records. Marine resource exploitation is recorded in the African zone of the Strait, where malacofauna is found in the Middle Pleistocene levels at Benzú rock shelter dated at 254 ka. To the north of the strait, the Cadiz coast has shell midden sites associated with Mousterian technology. Continuity in the technological records related to the Upper Palaeolithic is present in this area and on both slopes of the Strait, as in Nerja Cave (Spain), Gibraltar caves (UK) and the caves in the Tangier area (Morocco). Although some variability in the technological and cultural sequences has been observed on both sides of the strait the marine resources exploitation suggests similar ways of life. During the Holocene, continuity appears among agricultural groups. An increase in the fishing and shellfish collection by the Neolithic societies is a further interesting aspect of this region, as is shown in Tetouan Caves (Gar Cahal and Kaf That el Ghar) and Benzú Cave (Ceuta) on the southern side of the Strait, and Embarcadero Rio Palmones and Retamar (Cádiz) on the north side. The new data collected during recent years demonstrates a deeper antiquity of the shell midden deposits and in the exploitation of marine resources in this area for hunter-gatherer societies with Mousterian technology. A new vision also emerged for the economy of the Neolithic societies of the Strait of Gibraltar, with marine resources exploitation representing as a very important activity.

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1. Introduction

The African and European sides of the Strait of Gibraltar have similar geologic, geomorphologic, geographic and palaeoclimatic features, and common occupation processes in the Pleistocene and the Holocene. The potential role of Africa in the first occupation of Europe has been a much-discussed question, changing during the history of the archaeological research (Biberson, 1961; Pericot and Tarradell, 1962; Texier et al., 1985; Straus and Bar-Yosef, 2001; Aguirre and Carbonell, 2001; Raynal et al., 2010). Traditionally, the Middle East region has been studied to explain the origin of

anatomic modern humans (AMH) (Mellars and Stringer, 1989; Mellars, 1990; Bar-Yosef and Belfer-Cohen, 2001), and the presence of Neanderthals in the north of Africa has been questioned (Stringer et al., 2000; Hublin, 2001; Straus and Bar-Yosef, 2001).

In respect to the beginnings of agriculture and animal domestication, this region was considered as an area receiving new economic modes from the east of the Mediterranean (Amerman and Cavalli-Sforza, 1984; Guilaine, 2003). The Strait of Gibraltar is a territory of great interest for understanding the first human incursions into Europe, and population patterns during the Pleistocene and Holocene (Straus, 1992, 2005; Ramos, 2002, in press; Bouzouggar, 2003, 2006; Garcea, 2004; Barton et al., 2005, 2009; Finlayson et al., 2006; Bouzouggar et al., 2007).

In contrast to these views, the present authors are developing a model that considers the existence of contacts between prehistoric

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societies on both sides of the Strait. It is becoming clear that an early exploitation of marine resources during the Middle Pleistocene, with continuity in Late Pleistocene and a progressive increase up to an intensive exploitation of these resources by the Neolithic societies (Holocene).

2. Geographical context of the historical region of the Strait of Gibraltar: between the north of Africa and the south of Europe

The Strait of Gibraltar, between the south of the Iberian Peninsula and the north of Africa (Fig. 1) constitutes a historical region (see Sanoja and Vargas, 1995). The Strait is located in the Ibero-Moroccan Gulf, benefiting from a middle latitude temperate climate (Vanne and Menanteau, 2004) in an Atlantic-Mediterranean environment (Arteaga and Hoffmann, 1999). The geological features are similar on both sides of the Strait. This is a geological zone in which there are two important mountain ranges: the Rif and the Betic (which enclose the Alboran Sea), creating a tectonic belt known as the 'Gibraltar Arc'. The classical "Pillars of Hercules" are the limestone cliffs of the Gebel Musa and the Rock of Gibraltar, together with the calcareous massif of Gebel Fahies, and constitute the main relief of the area. The area is structurally complex with intensive folding accompanied by metamorphism and large over-thrust sheets.

3. Reflections on possible relationships and contacts in the Strait

Recent geological studies confirm that sea level fall, and even the presence of islands during cold and dry phases of the Quaternary, allowed for the movements of human groups along the coasts of the Strait of Gibraltar (Alimen, 1975; Collina-Girard, 2001; Fa

et al., 2001; Bouzouggar, 2003; Chalouan et al., 2008; El Kadiri et al., 2010). The issue of how Paleolithic communities crossed the Strait of Gibraltar is related to the debated evidence of a Mode I technocomplex of chopping tools industry that is more than a million years old and is present on the European side of the Strait. This clearly challenges the idea of short chronologies for the peopling of Europe and places the entire region in a pivotal role for the study of Paleolithic peopling. The debate on this topic is far from closed.

The present research raises the possibility of relationships and contacts between groups with Mode II technology – Acheulean technocomplex – during the Middle Pleistocene (Ramos, 2002, *in press*). This is indicated by the manifest correlation between the North African evidence and the technology in the southern part of the Iberian Peninsula from the stratigraphic series of the Guadalete and Guadalquivir rivers. It is clear in the technocomplex of the human groups of the south of the Iberian Peninsula the presence of bifaces, cleavers and trihedral that are very similar in forms and work processes to Mode II from North Africa. In this respect, it is important to recall the contribution made by Vallespí (1986, 1987, 1992) on the existence of an autochthonous or native Acheulean and the evolution of complexes of knapping pebbles (chopped) into bifaces industries. Vallespí put forward the idea of technological continuity in which the Iberian Old Acheulean continued in the Middle Acheulean. This model has been confirmed in the Guadalquivir Valley stratigraphic sequence (Vallespí, 1999). In this respect, it is of great interest also the Guadalete River sequence (Giles et al., 1996) and the ones of Palmones River, Campo de Gibraltar (Castañeda, 2008) and the Atlantic band of Cádiz (Ramos, 2008) that are the focus of this paper.

Furthermore, from a physical anthropology point of view, there seems to be a link between hominids in the TD6 level of Gran Dolina of Atapuerca and those of Ternifine-Tighenif (Aguirre, 2000:

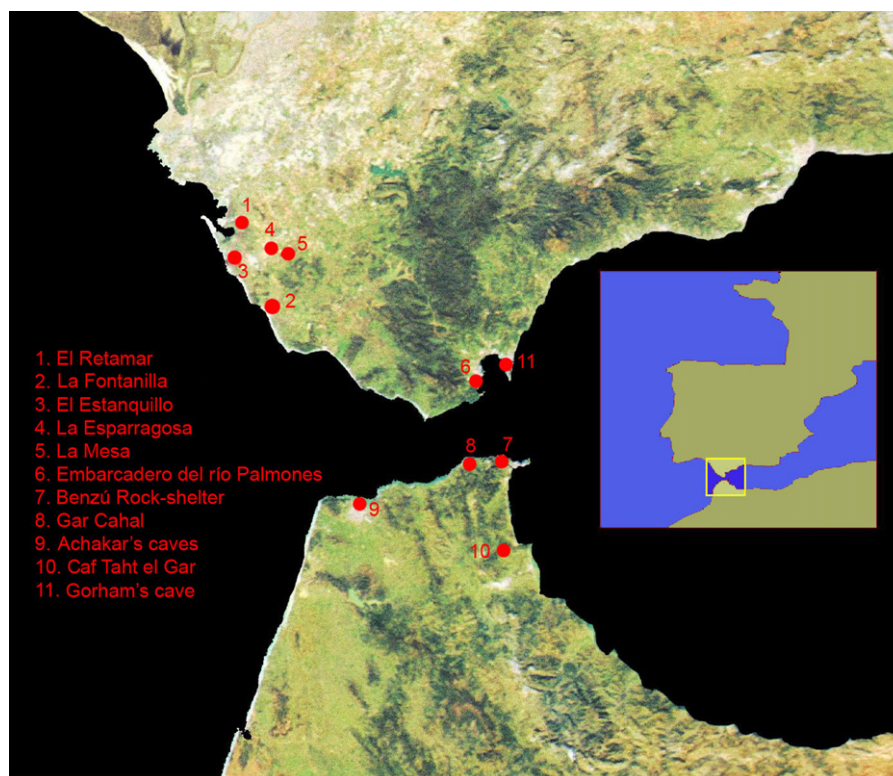


Fig. 1. Geographical location of the Strait of Gibraltar area.

72). The hypothesis proposed some years ago about the possibility of the presence of Neanderthal groups in North Africa is today questioned, and currently these groups are considered archaic *Homo sapiens* (Debénath, 2001; Zouak, 2001; Stringer and Andrews, 2005; Smith et al., 2007). In relation to this hypothesis, authors such as Stringer and Gamble (1996) denied the possibility of access routes to Europe through the Strait of Gibraltar, considering the only option being via the Middle East. The present authors think that these ideas should be re-evaluated, especially in relation to the many new data from North Africa and the southern Iberian Peninsula that have come to light in recent years. The data point to the existence of very early relationships and contacts between the populations of the two sides of the Strait.

It is possible to see clear similarities in lithic technologies emerging on both sides of the Strait for Mode I (Pleistocene), as is the case in the area of Orce (Martínez-Navarro et al., 1997; Gibert et al., 1998) and Aïn Hanech (Algeria) (Sahnouni et al., 2002). These similarities are also evident for Mode II (Lower and Middle Pleistocene), in sites of the Quaternary terraces of Casablanca on the south side (Raynal et al., 2010), and the Acheulean series in the Guadalquivir Valley (Vallespí, 1986, 1992, 1999), Guadalete river (Giles et al., 1996) and Campo de Gibraltar (Castañeda, 2008) on the European side. Finally, likeness exist as well for Mode III (Middle and Upper Pleistocene) at sites such as the Rock-shelter of Benzú, in Ceuta, on the African side (Ramos et al., 2008) and Gorham's Cave, in Gibraltar (Finlayson et al., 2001, 2006), in the north.

Independently from the anthropological evidence, there was occupation of both regions by human groups during the late Middle Pleistocene and early Pleistocene. These groups have a very similar Mousterian technology. The question that arises is: does a similar technology indicate anthropological similarities? The answer to the question should be *no*, as it is not possible to suggest a simple relationship between human groups and technocomplexes. However, there is the need to deepen the comprehension of the mode of production and the ways of life of prehistoric communities to obtain a more complete historical understanding of these societies. It is clear that recent political and economic history has shaped the current state of knowledge and the reality of scientific research (Hassar-Benslimane, 2001:7). Changes are observed in the research developed by groups working in this region and the development of several promising international collaborative projects. Progress has been made in determining the stratigraphic constructs of archaeological deposits. The contribution of better and more complete chronological sequences helped the development of the geological, archaeozoological and environmental records as well as in the formulation of hypotheses related to the economic and social spheres. Petrographic studies suggest that there was an Atlantic/Mediterranean circulation of the lithic materials. These developments are providing new supportive information for the suggestion of a wider Atlantic–Mediterranean region. This evidence gives the possibility of comparing the southern European record (Domínguez-Bella, 2002, 2006; Domínguez-Bella et al., 2000, 2004; Ramos et al., 2006) with the North African, such as in Tangier (Otte et al., 2004) and Ceuta-Tetouan (Domínguez-Bella et al. 2006; Domínguez-Bella and Maate, 2008).

The whole region of the Strait of Gibraltar is an area of great interest to explain the entry to Europe in the lower Pleistocene of different communities that originated in Africa. This should not be addressed solely in a diffusionist sense, and requires a better understanding of the historical, economic and social evidence to explain the relationships between South Europe and North Africa groups. Contacts and relations between these groups would not be strange, given the seasonal mobility related to their lifestyle (Sanoja and Vargas, 1995). In this regard, future systematic surveys on both sides of the Strait of Gibraltar, together with a better understanding of the data by using absolute dating of the already known deposits,

will eventually provide new information about the relationships between human groups from both sides of the Strait during the Pleistocene and Holocene.

4. Temporal sequences of marine resource exploitation in the Strait of Gibraltar area

4.1. African side of the Strait of Gibraltar

4.1.1. Middle and Upper Pleistocene marine resource exploitation: Benzú Rock-shelter

The Benzú rock shelter is located within the North African coast of the Strait (Fig. 1), in a strategic geographical setting directly facing the caves of Gibraltar (Finlayson et al., 2001, 2006). The rock shelter opens in Triassic dolomitic formations and has very steep, almost vertical, walls. The archaeological sequence spans the Pleistocene, also providing environmental and ecological data for the surrounding area (Ramos and Bernal, 2006). The archaeological deposit is made of carbonated breccias, speleothem formations and cave wall collapses. Seven of the ten levels (Fig. 2) described at Benzú rock shelter show evidence of human occupation with lithic artefacts associated with bone and shell remains.

Detrital levels (1–8) can be grouped in three sequences: levels 1, 2 and 3; levels 4, 5, and 6; and levels 7 and 8. They constitute vertical accretion events caused by successive solifluction intrusions, possibly associated with cold and humid climatic conditions. The last detrital level (9) is a collapsed breccia from the shelter roof. Levels 3b and 10 are speleothems formed under warm and humid climatic conditions (Durán, 2003).

The lithic technology found in levels 1 to 7 was mostly obtained from local sources (Domínguez-Bella et al., 2006) and it is attributed to Mode III-Mousterian, showing many similarities with that found in the Southern Iberian Peninsula (Ramos et al., 2008). Usewear analyses of the scrapers from level 5 suggest that they were used to scrape leather (Ramos et al., 2008), while scrapers from level 6 were used on wood (Clemente, 2006).

Th/U was used to date the speleothems levels (Durán, 2003) and OSL/SAR to date the sediments, framing the archaeological and sedimentary sequence to more than 70 ka. The archaeological record of the first human occupational levels has a date of ca. 250 ka (Ramos et al., 2008). Recent studies on the shelter micro-morphologic and bio-erosive features have shown that erosion at the site was active during MIS 9, before the beginning of the human occupation (Abad et al., 2007).

The faunal complex at Benzú is mostly composed of ungulates of average size. Malacofauna (*Patella* sp., *Patella vulgata* and *Glycimeris* sp) is present throughout the sequence (Fig. 3) and a sample from the lowest level was dated at 254 ± 17 ka. Ictiofauna (possibly Sparidae) was found in level 5a, dated by OSL at 168 ka.

4.1.2. Marine resources exploitation by the last hunter–fisher–gatherers and Neolithic societies

Benzú Cave (Ceuta) in the North African zone of the Strait of Gibraltar has a good assemblage of artefacts and biological remains belonging to the Neolithic (Fig. 1). Land gastropods, marine gastropods and bivalves, and fish vertebrae (from the Sparidae family - breams) are all present at the site. Land gastropods belong to Helicidae (*Otala lactea* Müller, *Otala punctata* Müller and *Massylaea* sp.) and Hygromiidae (*Ceruella virgata* Dacosta and *Oestophora* sp.). *O. lactea* is abundant, but *Massylaea* is the most common. Marine gastropods such as *Patella* sp and *Siphonaria pectinata* L. were also used as food, with lesser quantities of *Ostrea* sp. and *Mytilus* sp. The great majority of marine molluscs found at the site live in intertidal rocky areas easily accessible at low tide (Soriguer et al., 2006).

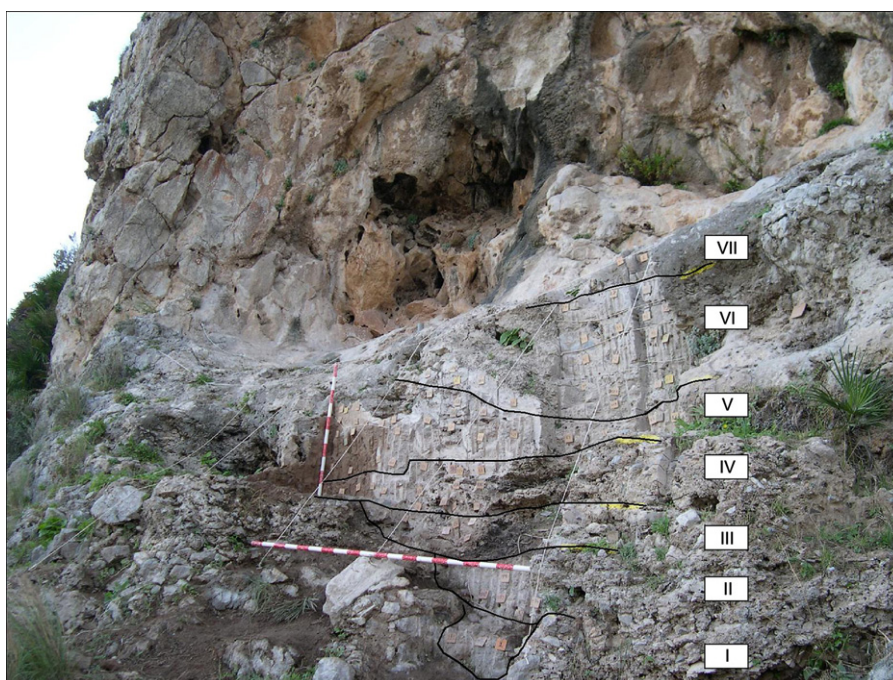


Fig. 2. Stratigraphic profile and archaeological sequence of Benu rock shelter. I to VII: archaeological levels with Mousterian technology.

TL dating places the Neolithic levels of Benzú cave in the VI millennium B.C. (Ramos and Bernal, 2006). Both domesticated fauna and abundant wild (hunted) fauna are present. Although the pollen analysis confirms a great potential for plant resources around this site, the marine resources played the most important role in these North African Neolithic communities.

The presence of numerous fish species was also observed in the Neolithic levels of Achakar caves (Tangier): *Dentex* sp, *Pagrus pagrus* Cuvier, *Sparus auratus* L., *Labrus* sp, *Temnodon saltator* L. and Thunnidae (tuna family) (Gilman, 1975: 85), as well as specimens of the seal *Monachus albiventer* Boddaert. In this cave, molluscs also are abundant: *Patella*, *Mytilus edulis* L. (mussel), *Ostrea*, *Venus*



Fig. 3. Malacofauna of genus Patellidae from level 1 (254 ± 17 ka) in the Benzú rock shelter.

verrucosa L., *Venerupis decussata* L. (clam), *Cardium edule* L. (cockle) (Gilman, 1975: 85–86). Sea birds were also found. The caves of Mugharet el Kahil and Mugharet es Saifiya, in the area of Tangier, also have evidence of fishing and shellfish collection from the rocky littoral and beaches.

Further evidence for mollusc exploitation comes from excavations of Caf That el Gar Cave (Tarradell, 1955, 1957–1958), the collections of which are in the Museum of Tetouan. References also exist in relation to Gar Cahal Cave (Tarradell, 1954).

4.2. Iberian side of the Strait of Gibraltar

4.2.1. Marine resource exploitation by the last hunter–fisher–gatherers of the Upper Palaeolithic and Mesolithic: Gibraltar, La Fontanilla, Embarcadero Río Palmones

In the Atlantic–Mediterranean zone of the Strait of Gibraltar, there is abundant evidence of sites, located in fluvial, endorheic deposits close to the beaches, with Mousterian technology. Evidence for the capture of dolphins and seals as well as molluscs collection is noted in level IV at Gorham's Cave (Gibraltar) (Fig. 1), together with the consumption of birds and rabbits (Stringer et al., 2008). The exploitation of marine resources is also present in later periods, as is clear in level III (Solutrean and Magdalenian) of Gorham's Cave, Gibraltar (Finlayson et al., 2006; Stringer et al., 2008) and in La Fontanilla Solutrean technology (Ramos, 2008).

The last hunter–gatherer communities show a historical continuity with the previous one. In the Algeciras Bay, the Embarcadero del río Palmones site (Fig. 1) is an example of a Mesolithic group settlement that carried out hunting and shellfish gathering activities. It is a seasonal place prior to the period of the establishment of the semi-sedentary way of life that became prevalent in the area. Three excavations found structures of dismantled fireplaces, evidence of hunting and of the use of numerous plant resources (Ramos and Castañeda, 2005). The record shows the presence of 6 bivalve and 3 gastropods species, as well as fish vertebrae (Soriguer et al., 2005, 2008), attesting to the practice of shellfish gathering in a basically sandy/muddy intertidal area.

The lithic technology is geometric microliths, with backed bladelets, notches and scrapers (Domínguez-Bella et al., 2004). Functional analysis (Clemente and Pijoan, 2005) indicates that some microliths were used as projectiles either for hunting small fauna or for fishing while notches were used for the exploitation of woody resources. There is no evidence in the site for agricultural practice. Changes in the coastal morphology related to the Flandrian Transgression (Arteaga and Hoffmann, 1999) considerably affected site preservation, making it difficult to clearly understand the settlement distribution pattern in this area.

4.2.2. Marine resource exploitation by neolithic societies: El Retamar, El Estanquillo, La Mesa, La Esparragosa

El Retamar is an archaeological site located in the Bay of Cadiz (Fig. 1), set on Pliocene units of yellow sand. The site rests on a former beach, fossilised by eolian sands that covered it and today showing a soil with vegetation. During the Flandrian eustatic rise the continental areas were flooded, with the consequential formation of new beaches. At this point, a sea inlet connected the flat area of the Manchón de Mora with the sea, creating a beach where the site is located (Gracia et al., 2002).

The excavation of El Retamar has uncovered a wide area of more than 800 m², with numerous *in situ* structures (62 fireplaces, 10 shell middens, 24 concentrations of stones and 2 burial areas) and archaeological products (Ramos and Lazarich, 2002). The ceramic technology is of typical Cardial and smooth styles. The lithic technology is characterized by geometric microliths with backed bladelets.

The archaeological record of this seasonal settlement attests to fishing and processing as well as preparation and consumption of shellfish and fish. Numerical dating places the site in the VI millennium cal. B.C. (Ramos and Lazarich, 2002; Ramos et al., 2005) (Table 1).

The malacofauna remains indicates a minimal number of 2477 individuals, 1845 of which are bivalves (74.49%), 588 gastropods (23.74%) and 44 crustaceans (1.77%). All the species found in this deposit are still present today on the Iberian coast (Moreno, 1995; Soriguer et al., 2002). Only 6 species (94%) make up the malacofauna record: *Solen marginatus* Boeck (almost 50%), *Trunculariopsis trunculus* L., *Murex brandaris* L., *Tapes decussates* L., *Scrobicularia plana* Beille y *Cerithium vulgatum* Bruguiere. These species constituted an important food resource from the very shallow waters and the intertidal zone, in sandy and muddy marine floors.

With regard to the presence of ichthyofauna, 7 different marine littoral species were identified, where the Sparidae (breams) group is dominant. However, epipelagic species that periodically migrated were also present, indicating that fishing occurred during the spawning season (autumn), when such species as the meagre (*Argyrosomus regius* Asso) and the tuna (*Thunnus thynnus* L.) approach shallow coastal water. Remains from hunting confirms frequentation of the site during the autumn (e.g. *Cervus elaphus* L.), with the terrestrial fauna composed of *Equus* sp., *Bos Taurus* L., *Sus domesticus* L., *Capra hircus* L., *Ovis aries* L., *Canis familiaris* L., *Oryctolagus cuniculus* L. (rabbit), *Lepus capensis* L. (hare) and *Alectoris rufa* L. (partridge). Wild fauna remains are more common than domesticated ones (Cáceres, 2003).

On the basis of the distribution of *Sparus aurata* L. remains, some associated with fireplaces, it is possible to suggest the existence of areas dedicated to *in situ* consumption and others where the fish was only prepared (i.e. decapitation and possible evisceration). The technological analyses and the spatial distribution of the diverse archaeological record, allowed identification of the work processes related to hunting and shellfish gathering (Ramos and Lazarich, 2002).

There is continuity of regional occupation as well as of the exploitation of marine resources into the V–IV millennium B.C. The island of San Fernando in the Bay of Cadiz has a maximum elevation of 30 m above sea level in the Cerro de los Mártires. Archaeological sites are concentrated on its south side, opposite Chiclana de la Frontera. Neolithic occupation is attested in El Estanquillo-Phase I (Fig. 1) and other similar nearby sites such as Camposoto, La Marquina C, Pago de la Zorrera, Núñez, Huerta de la Compañía, Pago de Retamarillo, Avenida de la Constitución, Huerta del Contrabandista, Huerto del Tesoro, Colegio Avenida de la Constitución, Edificio Berenguer (Ramos, 2008) and Campo de Hockey (Vijande, 2009).

The Neolithic horizons at El Estanquillo are deposited over aeolianites and carbonates. These deposits are characterised by a pedosedimentary complex of rubefied layers topped by deposits transported by water (Borja and Ramos, 1993), and no structures were identified (Ramos, 2008). The record from El Estanquillo

Table 1
Numerical dates, El Retamar.

Fireplace 18	6780 ± 80 BP	cal.5025 B.C.	Beta-90122, Beta Analytic
Fireplace 18	7280 ± 60 BP	cal. 5717 B.C.	Sac. 1525. Instituto Tecnológico e Nuclear. Química. Sacavém
Shell midden 6	7400 ± 100 BP	cal 5889 B.C.	Sac. 1676. Instituto Tecnológico e Nuclear. Química. Sacavém

(Fig. 1) has evidence of four species of marine bivalves (Menez, 1994), one marine gastropod and one freshwater gastropod. The Ostreidae family is the most represented, and the shells have thick and strong valves. Two species of bivalves with a much more fragile shell, *Tapes decussatus* and *Ensis* sp., were clearly collected for food consumption, as there is a complete absence of ornaments made from shells.

In general, all Neolithic deposits in San Fernando Island show very uniform lithic products with trapeziums, backed bladelets, truncated bladelets, notches, denticulates, scrapers, burins and numerous pebbles. The pebbles are found abundantly in the coastal sites associated with shell remains, suggesting a use of these utensils for marine products processing (Ramos, 2008). The presence of cattle and pig bones in the excavation of El Estanquillo phase I (Bernáldez, 1994) confirms the presence of animal domestication.

The open-air sites of the San Fernando Island indicate an exploitation of the coast environment together with the utilization of inland areas for agricultural practices (Bernáldez, 1994). Shellfish constitute a key resource within these settings (Menez, 1994). Similar discoveries have been made on the Island of Cadiz (Borja and Ramos, 1993: 20). The lithic and ceramic evidence set the archaeological sites of Cadiz in the V–IV millennia B.C. and point to hunting, fishing and shellfish collection (Lazarich, 2003: 93–94). In the inland areas of the Bay of Cádiz (e.g. Chiclana de la Frontera), archaeological sites including La Mesa (Fig. 1) and Arroyo Galindo, Arroyo de la Cueva, Casa de la Esparragosilla and Lagunetas-I, as well as other sites in the landscape of the Atlantic coast were studied (Ramos, 2008). On Cadiz Island, the inland Neolithic sites are synchronous with the coastal ones, but they have slightly different records of lithic technology (Ramos, 2008). A preliminary functional study of La Mesa materials (Fig. 1) confirms the presence of sickles in the lithics recovered during the 1998 excavation (Clemente and García, 2008). Similar records are documented for the North Africa side of the Strait. Recent studies in the region have indeed provided more information about chronology, lithic and ceramic technology as well as the economic resources of these human Neolithic groups in North Morocco (Daugas and El Idrissi, 2008; Bouzouggar, 2006).

A site placed in the south area of the Bay of Cadiz, La Esparragosa (Chiclana de la Frontera) (Fig. 1) occupied a prominent plateau on the River Iro. Part of this settlement has been excavated and sub-circular silos were found. These structures were filled with fauna, malacofauna, knapped lithic industry and handmade ceramics. The silos correspond with a level of settlement abandoned and have a very homogeneous stratigraphic deposition. A burial structure was associated with numerous lithic and ceramic products, terrestrial fauna and malacofauna (Pérez et al., 2005). Two TL dating determinations were obtained on ceramic samples from the burial (MAD-3961: 5255 ± 433 B.P. and MAD-3962: 5129 ± 476 B.P. Laboratory of Dating and Radiochemistry, Universidad Autónoma de Madrid). The excavated archaeological products were very uniform, consisting basically of fragments of handmade ceramics, in general very alike, typical of contexts dating to the IV millennium B.C. (Pérez, 2003).

Preliminary study of the functionality of the knapped lithic products of La Esparragosa shows the presence of instruments used for the exploitation of plant resources, sickles associated with agricultural practices, products used as projectiles and instruments used for the processing of animal resources (Clemente and García, 2008). More specifically, the usewear analysis together with the results from experimental archaeology tests confirms the use of some instruments for fish cutting and filleting, and the instruments might have been mounted on a handle (Clemente and García, 2008).

Deer, cattle, ovi-caprine, equine, and canine bones characterise the terrestrial fauna. The marine fauna includes the remains of a minimum number of 2235 individuals, belonging to a whole of 29 taxa. Of these, 16 are marine bivalves that also represent the dominant group, as it is the case in the majority of the deposits studied along the Atlantic Band of Cadiz. Six of the marine gastropods and four freshwater gastropods are very common in the area, with the exception of *Pseudotrachea litturata* Boettger that is typical of rocky areas. One species of freshwater bivalve, crab shells, sea urchin spines and the remains of two more non-identified invertebrates were also found. The dominant bivalve species is *Tapes decussatus*, which represents almost half of the studied specimens, with *Pecten* and the freshwater gastropod *Theba pisana* the next abundant. *T. decussatus* has a significant presence in the burial, with 477 specimens of great size, many of them complete with both valves. The relative dominance of these species in this structure is by far the highest in the whole deposit. The burial area has almost 22% of the identified specimens. Only the remains of one *Pecten maximus* L, another of *Chlamys* sp, as well as three *Theba pisana* Miller (Mediterranean snail) were found.

On the other hand, a high variability in the malacofauna appears in the silos. The importance as a food resource of many species found, such as *T. decussatus*, *S. plana* and *S. marginatus*, is evident.

The malacofauna indicates the continuity of the work processes linked to the exploitation of the marine environment (Fig. 4). Usewear analysis indicates that the knapped lithic products were used for the cleaning and filleting of fish destined to *in situ* consumption or for distribution to sites in the interior (Clemente and García, 2008: 190–194).

5. Discussion

5.1. Continuity of marine resources exploitation on the two sides of the Strait of Gibraltar from Paleolithic to Neolithic

The archaeological survey conducted on the two sides of the Strait of Gibraltar shows that the exploitation of marine resources by hunter–gatherer societies was happening earlier than in rest of the Iberian Peninsula. In general, it has been suggested that the exploitation of marine resources in the Upper Palaeolithic started at around 40 ka (Straus, 1992). In the Strait region, since the Middle Pleistocene, groups with Mousterian technology and chronologies of 250–70 ka lived close to the sea and utilised marine resources in addition to other economic forms of hunting and gathering. The exploitation of marine resources occurred continuously during the Upper Pleistocene.

During the Neolithic, fishing practices and the gathering of shellfish became even more important. On the basis of the archaeological evidence, there were highly specialized coastal groups exploiting the substantial marine resources available, and groups living in the inland areas that focused more on agricultural practices.

5.2. Similarity between the two sides of the Strait of Gibraltar

The data available confirms the strong similarities between the Iberian and African side of the Strait (Fig. 5), such as in the records of marine fauna at Benzú rock shelter (Ramos et al., 2008) and Gorham's Cave (Finlayson et al., 2006) for Paleolithic levels. The Upper Paleolithic continuity is shown in Gar Cahal (Bouzouggar, 2003, 2006), Kaf That El Ghar (Daugas and El Idrissi, 2008) and the caves of Achakar Cape (Gilman, 1975) for the African side and Gorham's Cave for the Iberian side. The similarity during the Neolithic is also evident (Fig. 5) in the North African records from the caves of Gar Cahal (Bouzouggar, 2003, 2006), Kaf That El Ghar

Hunter-gatherers with a Mousterian technology, between 250 and 70 ka, exploited marine resources in the Strait of Gibraltar. This occupation of coastal areas and exploitation of the resources that started during the Middle Palaeolithic continued during the Upper Palaeolithic and the Mesolithic, until the Neolithic tribal communities. Recently excavated sites in the Bay of Cadiz and the Strait itself also confirm fishing and shellfish activities during the VI–IV millennia B.C. (Ramos et al., 2010).

The IV millennium B.C. settlements took the form of villages with habitation areas, fields of storage silos, and areas for the production of lithic tools (e.g. La Mesa and La Esparragosa sites) (Ramos, 2008). In this period, agricultural practices became more important. However, hunting, fishing and shellfish gathering remained a fundamental aspect of an economy that was largely based on the exploitation of the resources in the Bay of Cadiz and on the Atlantic littoral (Arteaga et al., 2001; Pérez, 2003; Ramos, 2008; Ramos and Cantillo, 2009).

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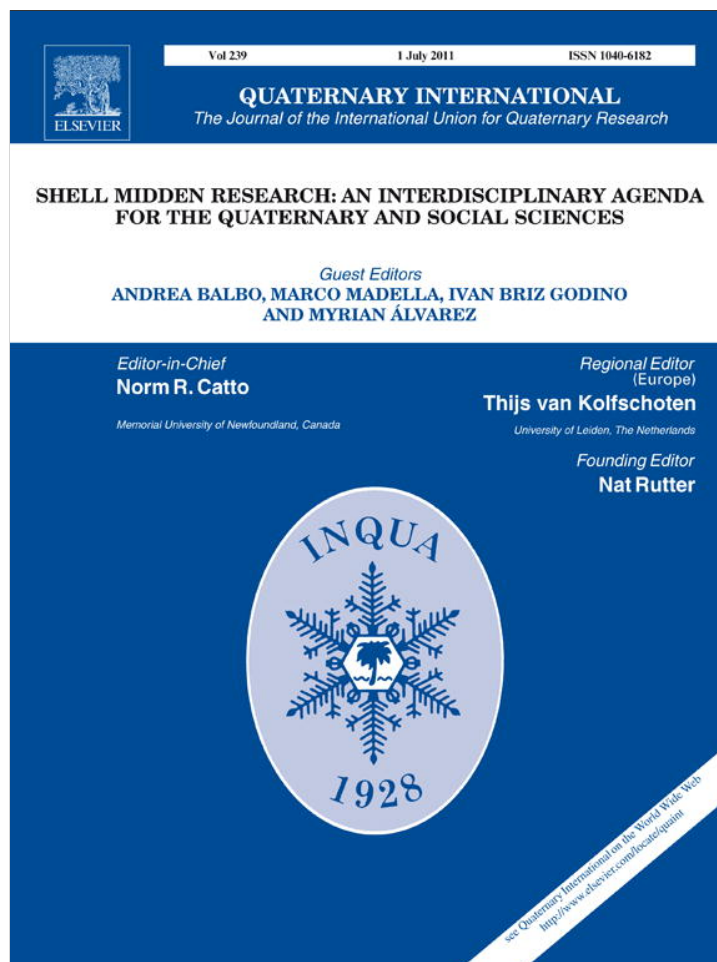
References

- Abad, M., Cáceres, L.M., Rodríguez-Vidal, J., Ruiz, F., López-González, N., Chamorro, S., Bernal, D., Ramos, J., 2007. Rasgos morfológicos y bioerosivos en un alto nivel marino del Pleistoceno Medio: El Abrigo arqueológico de la Caballilla de Benzú (Ceuta). XII Reunión Nacional de Cuaternario. AEQUA.
- Aguirre, E., 2000. Evolución humana debates actuales y vías abiertas. Real Academia de Ciencias Exactas, Físicas y Naturales, Madrid.
- Aguirre, E., Carbonell, E., 2001. Early human expansions into Eurasia: the Atapuerca evidence. *Quaternary International* 75, 11–18.
- Alimen, M.H., 1975. Les 'isthmes' hispano-marocain et Siculo-Tunisien aux temps acheuléens. *L'Anthropologie* 79 (3), 399–436.
- Amerman, A.J., Cavalli-Sforza, L.L., 1984. The Neolithic Transition and the Genetics of Populations in Europe. Princeton University Press, 176 pp.
- Arteaga, O., Hoffmann, G., 1999. Dialéctica del proceso natural y sociohistórico en las costas mediterráneas de Andalucía. *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social* 11, 13–121.
- Arteaga, O., Kölling, A., Kölling, M., Roos, A.M., Schulz, H., Schulz, H.D., 2001. El Puerto de Gadir. Investigación geoarqueológica en el casco antiguo de Cádiz. *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social* 11, 345–415.
- Bar-Yosef, O., Belfer-Cohen, A., 2001. From Africa to Eurasia. Early dispersals. *Quaternary International* 75, 19–28.
- Barton, R., Bouzouggar, A., Collcutt, S., Gale, R., Higham, T., Humphrey, L., Parfitt, S., Rhodes, E., Stringer, C., Malek, 2005. The late Upper Palaeolithic occupation of the Moroccan Northwest Maghreb during the last Glacial maximum. *African Archaeological Review* 22 (2), 77–100.
- Barton, R., Bouzouggar, A., Collcutt, S., Schwenninger, J.L., Clark-Balzan, L., 2009. OSL of the Aterian levels at Dar es-Soltan I (Rabat, Morocco) and implications for the dispersal of modern. *Homo Sapiens. Quaternary Science Reviews* 28, 1914–1931.
- Bernáldez, E., 1994. Inferencias paleoecológicas y paleoeconómicas del estudio taxonómico del yacimiento de El Estanquillo en San Fernando, Cádiz. In: Ramos, J., Sáez, A., Castañeda, V., Pérez, M. (Eds.), *Aproximación a la Prehistoria de San Fernando*. Fundación Municipal de Cultura, San Fernando, pp. 203–230.
- Biberson, P., 1961. Le Paléolithique Inférieur du Maroc Atlantique. Publications du Service des Antiquités du Maroc 17, Rabat.
- Borja, F., Ramos, J., 1993. Las costas atlánticas de Cádiz durante los últimos 30.000 años. Paleoclimas e impacto antrópico. *Cuadernos de Geografía* 4, 13–29.
- Bouzouggar, A., 2003. La fin du Paléolithique moyen sur la façade atlantique marocaine entre Tanger et Rabat. Perspectives paléogéographiques. *Beiträge zur Allgemeinen und Vergleichenden Archäologie* 23, 75–84.
- Bouzouggar, A., 2006. Le Néolithique de la région de Tanger-Tétouan: contribution de la technologie lithique. In: BernalD., RaissouniB., RamosJ. y Bouzougar, A. (Eds.), *Actas del I Seminario Hispano-Marroquí de especialización en Arqueología*. Universidad de Cádiz, Cádiz, pp. 133–142.
- Bouzouggar, A., Barton, R., Vanhaeren, M., D'Errico, F., Collcutt, S., Higham, T., Hodge, E., Parfitt, S., Rhodes, E., Schwenninger, J.L., Stringer, C., Turner, E., Ward, S., Moutmir, A., Stambouli, A., 2007. 82.000-year-old shell beads from North Africa and implications for the origins of modern human behaviour. *PNAS* 104 (24), 9964–9969.
- Bouzouggar, A., Kozłowski, J., Otte, M., 2002. Étude des ensembles lithiques atériens de la grotte d'El aliya à Tanger (Maroc). *L'Anthropologie* 106, 207–248.
- Cáceres, I., 2003. La transición de los cazadores-recolectores a pastores-agricultores en el Mediodía peninsular a través de los restos óseos. Tesis Doctoral. Universidad de Cádiz, p. 391.
- Castañeda, V., 2008. Las primeras ocupaciones humanas de Los Barrios (Cádiz). El ejemplo proporcionado por el Río Palmones. Servicio de Publicaciones Universidad de Cádiz. Monografías Historia y Arte. Universidad de Cádiz y Ayuntamiento de Los Barrios, Cádiz.
- Chalouan, A., Sanz de Galdeano, C., Galindo-Zaldívar, J., Julià, R., El Kadiri, K., Pedrera, A., Hlila, R., Akil, M., Ahmamou, M., 2008. Edad U/Th de los travertinos de Beni Younech y correlación con las terrazas marinas cuaternarias de Ras Leona (SE del Estrecho de Gibraltar, Marruecos). *Geogaceta* 45, 35–38.
- Clemente, I., 2006. Para qué se usaron esas piedras? El análisis funcional como respuesta a viejas cuestiones. In: RamosJ., D. Bernal (Eds.), *El Proyecto Benzú. 250.000 años de historia en la orilla africana del Círculo del Estrecho. 30 p.eguntas y 10 opiniones*. Ciudad Autónoma de Ceuta, Universidad de Cádiz, Cádiz, pp. 89–95.
- Clemente, I., Pijoan, J., 2005. Estudio funcional de los instrumentos de trabajo lítico en el "Embarcadero del río Palmones. In: RamosJ., CastañedaV (Eds.), *Excavación en el asentamiento prehistórico del Embarcadero del río Palmones (Algeciras, Cádiz)*. Universidad de Cádiz y Ayuntamiento de Algeciras, Cádiz, pp. 252–282.
- Clemente, I., García, V., 2008. Yacimientos arqueológicos de la costa atlántica de la Bahía de Cádiz. Aplicación del análisis funcional a los instrumentos de trabajo líticos del Embarcadero del río Palmones, La Mesa y La Esparragosa. In: Ramos, J. (Ed.), *Memoria del proyecto de investigación: La ocupación prehistórica de la campiña litoral y banda atlántica de Cádiz*, Sevilla, Arqueología Monografías. Junta de Andalucía, Sevilla, pp. 185–198.
- Collina-Girard, J., 2001. L'Atlantide devant le Détroit de Gibraltar? Mythe et géologie. *333. C.R. Acad. Sci de Paris*. 233–240.
- Daugas, J.P., El Idrissi, A., 2008. Néolithique Ancien du Maroc dans son contexte régional. In: RamosJ., ZouakM., BernalD., RaissouniB. (Eds.), *Las ocupaciones humanas de la cueva de Caf Taht el Ghar (Tetuán). Los productos arqueológicos en el contexto del Estrecho de Gibraltar*. Universidad de Cádiz, Diputación de Cádiz, Dirección Regional de Cultura Tánger-Tetuán del Reino de Marruecos, Cádiz, pp. 63–91.
- Debénath, A., 2001. La recherche Archéologique au Maroc: quelques éléments concernant le Paléolithique. In: *Actes des Premières Journées Nationales d'Archéologie et du Patrimoine* 19–23. Rabat.
- Domínguez-Bella, S., 2002. Geología del Arco de Gibraltar. El Sur de la Península Ibérica y el Norte de África, como fuentes potenciales de materias primas minerales en la Prehistoria. In: Tilmatine, M., Ramos, J., y Castañeda, V. (Eds.), *Libro de Actas de las 1ª Jornadas de Estudios Históricos y Lingüísticos...*, pp. 219–232. Universidad de Cádiz.
- Domínguez-Bella, S., 2006. Estudio de las materias primas en la Prehistoria del ámbito gaditano. In: Bernal, D., Raissouni, B., Ramos, J., y Bouzouggar, A. (Eds.), *Actas del I Seminario Hispano-Marroquí de especialización en Arqueología*. Universidad de Cádiz, Cádiz, pp. 77–87.
- Domínguez-Bella, S., Maate, A., 2008. La geología del entorno de la Cueva de Caf That el Ghar y las materias primas líticas del Norte de Marruecos, región del Estrecho de Gibraltar. In: Ramos, J., Zouak, M., Bernal, D., y Raissouni, B. (Eds.), *Las ocupaciones humanas de la cueva de Caf That el Ghar (Tetuán). Los productos arqueológicos en el contexto del Estrecho de Gibraltar*, pp. 27–35. Colección de Monografías del Museo Arqueológico de Tetuán I. Cádiz.
- Domínguez-Bella, S., Pérez, M., Morata, D., 2000. Mineralogical and petrological characterization of polished lithic material from La Viña-Cantarranas Neolithic/Aeneolithic site (Puerto de Santa María, Cádiz, Spain). *Krystallinikum* 26, 57–65.
- Domínguez-Bella, S., Ramos, J., Castañeda, V., García, M.E., Sánchez, M., Jurado, G., Moncayo, F., 2004. Lithic Products Analysis, Raw Materials and Technology in the Prehistoric Settlement of the River Palmones (Algeciras, Cádiz, Spain). *BAR International Series* 1270. Oxford. 47–55.
- Domínguez-Bella, S., Chamorro, S., Ramos, J., Bernal, D., 2006. Materias primas minerales y geología en el entorno del Abrigo y la Cueva de Benzú (Ceuta). In: Martínez, G., Morgado, A., Afonso, J.A. (Eds.), *Sociedades Prehistóricas, Recursos Abióticos y Territorio*. Universidad de Granada, pp. 119–133.
- Durán, J.J., 2003. Informe geológico del Abrigo de Benzú. In: RamosJ., BernalD., CastañedaV (Eds.), *El Abrigo y la Cueva de Benzú en la Prehistoria de Ceuta*. Consejería de Educación y Cultura de Ceuta, UNED, Universidad de Cádiz, Cádiz, pp. 263–266.
- El Kadiri, K., Sanz de Galdeano, C., Pedrera, A., Chalouan, A., Galindo-Zaldívar, J., Julià Brugués, R., Akil, M., Hlila, R., Ahmamou, M., 2010. Eustatic and tectonic controls on Quaternary Ras Leona marine terraces (Strait of Gibraltar, northern Morocco). *Quaternary Research* 74 (2), 277–288.
- Fa, D., Finlayson, C., Giles, F., Finlayson, G., Aguilera, A., 2001. Building Bridges: new perspectives on out of Africa. In: Report on Neanderthals and Modern Humans in Late Pleistocene Eurasia. Calpe 2001 Conference, pp. 31–34 (Gibraltar).

- Finlayson, C., Barton, R., Stringer, C., 2001. The Gibraltar Neanderthals and their extinction. In: Zilhao, J., Aubry, T., Carvalho, A. (Eds.), *Les Premiers Hommes Modernes de la Péninsule Ibérique*. Inst. Português de Arqueologia, *Trabalhos de Arqueologia* 17, Lisbon, pp. 117–122.
- Finlayson, C., Giles Pacheco, F., Rodríguez-Vidal, J., Fa, D.A., Gutiérrez, J.M., Santiago, A., Finlayson, G., Allue, E., Baena, J., Cáceres, I., Carrión, J.S., Fernández Jalvo, Y., Glead-Owen, C.P., Jiménez-Espejo, F.J., López, P., López, J.A., Riquelme, J.A., Sánchez, A., Giles Guzman, F., Brown, K., Fuentes, N., Valarino, C.A., Villalpando, A., Stringer, C.B., Martínez-Ruiz, F., Sakamoto, T., 2006. Late survival of Neanderthals at the southernmost extreme of Europe. *Nature* 443, 850–853.
- Garcea, E., 2004. Crossing Deserts and Avoiding seas: atherian north African-European relations. *Journal of Anthropological Research* 60 (1), 27–53.
- Gibert, J., Gibert, L., Iglesias, A., Maestro, E., 1998. Two 'Oldowan' assemblages in the Plio-Pleistocene deposits of the Orce region, southeast Spain. *Antiquity* 72 (275), 17–25.
- Guilaine, J., 2003. De la vague à la tombe. La conquête néolithique de la Méditerranée (8000-2000 avant notre ère). Seuil, Paris, p. 380.
- Giles, F., Gutiérrez, J.M., Mata, E., Santiago, A., 1996. Laguna de Medina, Bassin du fleuve Guadalete (Cadiz, Espagne) un gisement Acheuléen Ancien dans le cadre des occupations humaines de la Péninsule Ibérique. *L'Anthropologie* 100 (4), 507–528.
- Gilman, A., 1975. A Later Prehistory of Tangier. American School of Prehistoric Research, Morocco. Peabody Museum 29. Cambridge. Massachusetts, p. 181.
- Gracia, F.J., Benavente, J., Pozo, Martínez del, 2002. Geomorfología y emplazamiento. Enmarque holoceno de 'El Retamar'. In: Ramos, J., Lazarich, M. (Eds.), *El asentamiento de "El Retamar" (Puerto Real, Cádiz)*. Universidad de Cádiz y Ayuntamiento de Puerto Real, Cádiz, pp. 27–36.
- Hassas-Benslimane, J., 2001. La recherche archéologique au Maroc durant deux décennies. In: *Actes des 1ères Journées Nationales d'Archéologie et du Patrimoine* 7–12. Rabat.
- Hublin, J.J., 2001. Northwestern Africa Middle Pleistocene hominids and their bearing on the emergence of *Homo sapiens*. In: Barham, L., Robson-Brown, K. (Eds.), *Human Roots. Africa and Asia in the Middle Pleistocene*. ChERUB. Western Academic and Specialist Press Ltd, Bristol, pp. 99–121.
- Lazarich, M., 2003. Informe preliminar del proyecto de estudio de los materiales arqueológicos calcolíticos y de comienzos de la Edad del Bronce, hallados en excavaciones de urgencia realizadas en el caso urbano de Cádiz. *Anuario Arqueológico de Andalucía*, 2000-II. 85–96.
- Martínez-Navarro, B., Palmqvist, P., Arribas, A., Turq, A., Agustí, J., Oms, O., 1997. Síntesis de las investigaciones paleontológicas y arqueológicas en el Plio-Pleistoceno de la región de Orce. *Cuaternario Ibérico*, 261–1997.
- Mellars, P., 1990. *The Neanderthal Legacy*. Princeton University Press, Princeton.
- Mellars, P., Stringer, C. (Eds.), 1989. *The Human Revolution*. Edinburgh University Press, Edinburgh.
- Menez, A., 1994. A preliminary analysis of the Mollusks from the El Estanquillo excavation. In: Ramos, J., Sáez, A., Castañeda, V., Pérez, M. (Eds.), *Aproximación a la Prehistoria de San Fernando*. Fundación Municipal de Cultura, San Fernando, pp. 191–202.
- Moreno, R., 1995. *Arqueomalacofauna de la Península Ibérica: un ensayo de síntesis*. *Complutum* 6, 353–382.
- Otte, M., Bouzouggar, A., Kozłowski, J., 2004. La Préhistoire de Tanger (Maroc). *Eraul* 105. Université de Liège.
- Pérez, M., 2003. *Primitivas comunidades aldeanas en Andalucía*. Libro electrónico. ProQuest Information and Learning, p. 384.
- Pérez, M., Ramos, J., Vijande, E., Castañeda, V., 2005. Informe preliminar de la excavación arqueológica de urgencia en el asentamiento prehistórico de La Esparragosa (Chiclana de la Frontera, Cádiz). *Anuario Arqueológico de Andalucía*, 2002 III, 93–103.
- Pericot, L., Tarradell, M., 1962. *Manual de Prehistoria Africana*. Instituto de Estudios Africanos. Consejo Superior de Investigaciones Científicas, Madrid.
- Raynal, J.P., Sbihi-Alaoui, F.Z., Mohib, A., El Graoui, M., Lefèvre, D., Texier, J.P., Geraads, D., Hublin, J.J., Smith, T., Tafforeau, P., Zouak, M., Grün, R., Rhodes, E.J., Eggins, S., Daujeard, C., Fernandes, P., Gallotti, R., Hossini, S., Queffelec, A., 2010. Hominid cave at Thomas Quarry I (Casablanca, Morocco): recent findings and their context. *Quaternary International* 223–224, 369–382.
- Ramos, J., 2002. Reflexiones para el estudio de las primeras comunidades de cazadores-recolectores del Norte de África y del Sur de la Península Ibérica. Medio natural, relaciones y contactos. In: Tilmatine, M., Ramos, J., Castañeda, V. (Eds.), *Primeras Jornadas de Estudios Históricos y Lingüísticos: El norte de África y el sur de la Península Ibérica*. Universidad de Cádiz, Cádiz, pp. 11–70.
- Ramos, J., in press. Les occupations humaines du Pléistocène dans le cadre géographique du Détroit de Gibraltar. Contributions récentes, relations et contacts. *Colloque International Préhistoire Maghrébine*. 5–7–2008. Tamanrasset.
- Ramos, J., 2011. Memoria del proyecto de investigación: La ocupación prehistórica de la campiña litoral y banda atlántica de Cádiz. *Arqueología Monografías*. Junta de Andalucía, Sevilla, p. 382.
- Ramos, J., Bernal, D., 2006. El Proyecto Benjú 250.000 años de historia en la orilla africana del Círculo del Estrecho. 30 preguntas y 10 opiniones. Ciudad Autónoma de Ceuta. Universidad de Cádiz, Cádiz, p. 230.
- Ramos, J., Bernal, D., Domínguez-Bella, S., Calado, D., Ruiz, B., Gil, M.J., Clemente, I., Durán, J.J., Vijande, E., Chamorro, S., 2008. The Benjú rockshelter: a middle Palaeolithic site on the north African coast. *Quaternary Science Reviews* 27, 2210–2218.
- Ramos, J., Cantillo, J.J., 2009. Los recursos litorales en el Pleistoceno y Holoceno. Un balance de su explotación por las sociedades cazadoras-recolectoras, tribales comunitarias y clasistas iniciales en la región del Estrecho de Gibraltar. In: Bernal, D. (Ed.), *Arqueología de la pesca en Estrecho de Gibraltar*. De la Prehistoria al fin del mundo antiguo. Universidad de Cádiz, Cádiz, pp. 17–79.
- Ramos, J., Castañeda, V., 2005. Excavación en el asentamiento prehistórico del Embarcadero del río Palmones (Algeciras, Cádiz). Una nueva contribución al estudio de las últimas comunidades cazadoras y recolectoras. Universidad de Cádiz, Fundación Municipal de Cultura de Algeciras, Cádiz, p. 380.
- Ramos, J., Domínguez-Bella, S., Castañeda, V., 2006. Siliceous materials of the hunter-gatherer settlements from the Atlantic band of Cádiz (SW Spain) in the Upper Pleistocene. *Der Anschnitt* 19, 531–544.
- Ramos, J., Lazarich, M., 2002. El asentamiento de El Retamar (Puerto Real, Cádiz). Contribución al estudio de la formación social tribal y a los inicios de la economía de producción en la Bahía de Cádiz. Universidad de Cádiz, Ayuntamiento de Puerto Real, Cádiz, p. 435.
- Ramos, J., Lazarich, M., Herrero, N., Castañeda, V., Pérez, M., Domínguez-Bella, S., García, M.E., Cáceres, I., 2005. Le gisement néolithique de El Retamar. Un exemple des communautés du VIe millénaire a.n.e. dans la Baie de Cádiz (Espagne). In: XIV Congress de l'UISPP, BAR International Series 1303. Oxford, pp. 135–145.
- Ramos, J., Pérez, M., Domínguez-Bella, S., Soriguer, M., Zabala, C., Hernando, J., Ruiz, B., Gil, M.J., Jiménez, D., 2010. Las formaciones sociales tribales y clasistas iniciales en la Bahía de Cádiz. Medio natural y recursos. In: Gutiérrez, J.M. (Ed.), *De la Prehistoria a la Rábida y la Villa*. Arqueología de Rota y la Bahía de Cádiz. Ed. Fundación Zoilo Ruiz Mateos y Universidad de Cádiz, pp. 43–75. Cádiz.
- Sahnouni, M., Hadjouis, D., Van Der Made, J., Derradji, A., Canals, A., Medig, M., Belahrech, H., Harichane, Z., Rahbi, M., 2002. Further research at the Oldowan site of Aïn Hanech, north-eastern Algeria. *J. Hum. Evol.* 43, 925–937.
- Sanoja, M., Vargas, I., 1995. Gente de la canoa. Economía política de la antigua sociedad apropiadora del Noreste de Venezuela. Tropykos, Caracas.
- Smith, T., Tafforeau, P., Reid, D., Grün, R., Eggins, S., Boutakiout, M., Hublin, J.J., 2007. From the Cover: Earliest evidence of modern human life history in North African early *Homo sapiens*. *PNAS* 104 (15), 6128–6133.
- Soriguer, M., Zabala, C., Hernando, J., 2002. Características biológicas de la fauna marina del yacimiento de El Retamar. In: Ramos, J., Lazarich, M. (Eds.), *El asentamiento de El Retamar (Puerto Real, Cádiz)*. Universidad de Cádiz, Ayuntamiento de Puerto Real, Cádiz, pp. 193–204.
- Soriguer, M., Zabala, C., Hernando, J., 2005. Características biológicas de la malacofauna del yacimiento del Embarcadero del río Palmones. In: Ramos, J., Castañeda, V. (Eds.), *Excavación en el asentamiento prehistórico del Embarcadero del río Palmones*. Universidad de Cádiz, Ayuntamiento de Algeciras. Cádiz, pp. 337–342.
- Soriguer, M., Jiménez, D., Zabala, C., Hernando, J., 2006. Recogieron moluscos y peces. In: Ramos, J., Bernal, D. (Eds.), *El Proyecto Benjú. 250.000 años de historia en la orilla africana del Círculo del Estrecho*. 30 preguntas y 10 opiniones. Ciudad Autónoma de Ceuta y Universidad de Cádiz.
- Soriguer, M., Zabala, C., Jiménez, D., Hernando, J.A., 2008. La explotación de los recursos naturales en el territorio de la banda atlántica de Cádiz y área del Estrecho de Gibraltar durante la Prehistoria: Ictiofauna y Malacofauna. In: Ramos, J. (Ed.), *Memoria del proyecto de investigación: La ocupación prehistórica de la campiña litoral y banda atlántica de Cádiz*. Sevilla, Arqueología Monografías. Junta de Andalucía, Sevilla, pp. 273–286.
- Straus, L.G., 1992. Iberia Before the Iberians. The Stone Age Prehistory of Cantabrian Spain. University of New Mexico Press, Albuquerque.
- Straus, L.G., 2005. Armageddon or Entente the Demise of the European Neandertals in Isotope Stage 3. *Quaternary International* 137.
- Straus, L.G., Bar-Yosef, O. (Eds.), 2001. Out of Africa in the Pleistocene. *Quaternary International*, 75.
- Stringer, C., Andrews, A., 2005. *La evolución humana*. Akal, Madrid.
- Stringer, C., Barton, N., Finlayson, C. (Eds.), 2000. *Neanderthals on the Edge*. Oxbow Books, Oxford.
- Stringer, C., Finlayson, C., Barton, R., Fernández-Jalvo, Y., Cáceres, I., Sabin, R., Rhodes, E., Currant, A., Rodríguez Vidal, J., Giles, F., Riquelme, J.A., 2008. Neanderthal exploitation of marine mammals in Gibraltar. *PNAS* 105 (38), 14319–14324.
- Stringer, C., Gamble, C., 1996. En busca de los neandertales. La solución al rompecabezas de los orígenes humanos. Crítica, Barcelona.
- Tarradell, M., 1954. Noticia sobre la excavación de Gar Cahal. *Tamuda* 2, 344–358.
- Tarradell, M., 1955. Avance de la primera campaña de excavaciones en Caf Taht El Ghar. *Tamuda* 3, 307–322.
- Tarradell, M., 1957–1958. Caf Taht el Gar, cueva neolítica en la región de Tetuán (Marruecos). *Ampurias* XIX–XX, 137–166.
- Tarradell, M., 1959. El Estrecho de Gibraltar ¿Puente o frontera? (Sobre las relaciones post-neolíticas entre Marruecos y la Península Ibérica). *Tamuda* 7, 124–138.
- Texier, J.P., Raynal, J.P., Lefevre, D., 1985. Nouvelles propositions pour un cadre chronologique raisonné du Quaternaire marocain. *Comptes Rendus de l'Académie des Sciences* 301 (série II), 183–188.
- Vallespí, E., 1986. El Paleolítico Inferior y Medio en Andalucía. In: *Homenaje a Luis Siret (1934–1984)*. Junta de Andalucía, Sevilla, pp. 59–66.
- Vallespí, E., 1987. Sobre el Paleolítico Inferior inicial de la Península Ibérica. *Veleia* 4, 51–67.
- Vallespí, E., 1992. Las industrias achelenses de Andalucía: Ordenación y comentarios. *Spal* 1, 61–78.

- Vallespí, E., 1999. Comentario al Paleolítico Ibérico: continuidad, etapas y perduraciones del proceso tecnocultural. *Spal* 8, 39–46.
- Vanne, J.R., Menanteau, L., 2004. Géographie du golfe ibéro-marocain. Instituto Hidrográfico, Casa de Velázquez, Madrid, p. 228.
- Vijande, E., 2009. El poblado de Campo de Jockey (San Fernando, Cádiz): resultados preliminares y líneas de investigación futuras para el conocimiento de las formaciones sociales tribales en la Bahía de Cádiz (tránsito V-IV milenios a.n.e.). *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social* 11, 265–284.
- Zouak, M., 2001. Origine et évolution de l'Homme au Maghreb 'Hypothèses diverses. In: *Actes des 1ères Journées Nationales d'Archéologie et du Patrimoine (Rabat)* 154–156.

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