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

José Ramos a,*, Salvador Domínguez-Bella b, Juan Jesús Cantillo c, Mila Soriguer d, Manuela Pérez f, José Hernando d, Eduardo Vijande c, Cristina Zabal d, Ignacio Clemente e, Darío Bernal a

a Departamento de Historia, Geografía y Filosofía, Facultad de Filosofía y Letras, Universidad de Cádiz, Avenida Gómez Ulla s/n, 11010 Cádiz, Spain
b Departamento de Ciencias de la Tierra, Facultad de Ciencias, Universidad de Cádiz, Campus Río San Pedro, Puerto Real, 11510 Cádiz, Spain
c Becarios del Instituto de Estudios Ceutíes, Paseo del Revellín 30, 51080 Ceuta, Spain
d Departamento de Biología Animal, Facultad de Ciencias del Mar, Universidad de Cádiz, Campus Río San Pedro, Puerto Real, 11510 Cádiz, Spain
e Departamento de Prehistoria, Edifici B Facultat de Filosofia i Lletres, Universitat Autònoma de Barcelona, 08193 Bellaterra (Barcelona), Spain
f Postdoctoral Fellow, Departament de Prehistòria, Edifici B Facultat de Filosofia i Lletres, Universitat Autònoma de Barcelona, 08193 Bellaterra (Barcelona), Spain

ARTICLE INFO

Article history:
Available online 31 March 2011

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.

© 2011 Elsevier Ltd and INQUA. All rights reserved.

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; Bouzouggar et al., 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...
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 (Vanney 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 overthrust 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 Termifine-Tighenif (Aguirre, 2000:...
The hypothesis proposed some years ago about the possibility of the presence of Neandertal 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 Ain Hanchem (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 (Vallespi, 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 (Dominguez-Bella, 2002, 2006; Dominguez-Bella et al., 2000, 2004; Ramos et al., 2006) with the North African, such as in Tangier (Otte et al., 2004) and Ceuta-Tetuouan (Dominguez-Bella et al. 2006; Dominguez-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 (Dominguez-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 unguulates of average size. Malacofoana (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. Ictiofoana (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 Mysyllae sp.) and Hygromiidae (Cernuella virgata Dacosta and Oosthoora sp.). O. lactea is abundant, but Mysyllae 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).

Author’s personal copy
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*
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, Embarradero Rio Palmones

In the Atlantic–Mediterranean zone of the Strait of Gibraltar, there is abundant evidence of sites, located in fluviial, 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 Embarradero 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 Pijuan, 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 (Artéaga 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 insitu structures (62 fireplaces, 10 shell middens, 24 concentrations of stones and 2 burial areas) and archaeological products (Ramos and Lazarchik, 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 Lazarchik, 2002; Ramos et al., 2005) (Table 1).

The malaco fauna 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 malaco fauna record: Solen marginatus Boeck (almost 50%), Truncul- iopsis trunculus L, Murex brandaris L, Tapex 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, Orycto- lagus cuniculus L (rabbit), Lepus capensis L (hare) and Alectoris rufa L (partridge). Wild fauna remains are more common than domesticated ones (Cáceres, 2002).

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 Lazarchik, 2002).

There is continuity of regional occupation as well as of the exploitation of marine resources into the V–VI 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>
<thead>
<tr>
<th>Table 1</th>
<th>Numerical dates, El Retamar.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fireplace 18</strong></td>
<td><strong>Fireplace 18</strong></td>
</tr>
<tr>
<td>6780 ± 80 BP</td>
<td>7280 ± 60 BP</td>
</tr>
<tr>
<td>cal.5025 B.C.</td>
<td>cal. 5717 BC.</td>
</tr>
<tr>
<td>Beta-90122, Beta Analytic</td>
<td>Instituto Tecnológico e Nuclear. Química. Sacavém</td>
</tr>
<tr>
<td>Sac. 1525</td>
<td>Sac. 1676</td>
</tr>
<tr>
<td>Shell midden 6</td>
<td>7400 ± 100 BP</td>
</tr>
<tr>
<td>5889 BC.</td>
<td>cal. 5889 B.C.</td>
</tr>
<tr>
<td>Instituto Tecnológico e Nuclear. Química. Sacavém</td>
<td>Instituto Tecnológico e Nuclear. Química. Sacavém</td>
</tr>
</tbody>
</table>
(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 Cadiz (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 Esparragosoa (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 Esparragosoa 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 Pseudotrochaea litturata Boettger that is typical of rocky areas. One species of freshwater bivalve, crab shells, sea urchin spines and the remains of tow more non-identified invertebrates were also found. The dominant bivalve species is Tapes decussatus, which represents almost half of the studied specimens, with 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 Benizzi 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...
5.3. Presence of specialized tools for fish/mollusc preparation and/or consumption

The technology used for the processing of fish and shellfish is unknown in the Palaeolithic of the area. On the other hand, sites such as Embarcadero Rio Palmones and El Retamar (Fig. 1) are good examples of the presence of specialized tools for the exploitation of marine resources by the last hunter-gatherers (Ramos and Lazarich, 2002). The hypothesis proposed is that the microlith projectiles were used for either the hunting of small fauna or for fishing (Clemente and García, 2008).

In the site of El Retamar (Ramos and Lazarich, 2002) the lithic technology is defined by geometric microliths with backed bladelets. The functional and technological association of these microliths is similar to that from Embarcadero Rio Palmones site (Clemente and García, 2008). The technological analysis, the spatial distribution and the discovery of fauna indicate work processes related to hunting and shellfish gathering (Ramos and Lazarich, 2002).

6. Final remarks

The exploration and excavation projects on both sides of the Strait of Gibraltar suggest that there were contacts between hunter-gatherer Palaeolithic societies on the African and European sides of the Strait (Ramos, 2008; Ramos et al., 2008; Bouzouggar et al., 2002). For the Neolithic societies, the Strait of Gibraltar acted as a “bridge” rather than a “border” between groups living on the two sides (Tarradell, 1959; Ramos, 2002, in press).
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 to be found in the Bay of Cadiz and on the Atlantic littoral (Arteaga et al., 2001; Pérez, 2003; Ramos, 2008; Ramos and Cantillo, 2009).

Acknowledgments

This work has been financially supported by the Benzú Project (Spanish Ministry of Culture and Ceuta Government 158/08 – PV/ BENZU/CV), the Project DGES HAR2008-06477-C03-02. The AECID Hispanic-Moroccan projects PCI A/2893/05, A/6317/06 and A/010823/07, and Junta de Andalucía project P07-HUM-00315. Authors are grateful to Carol and Paul Beven and Ana Durante for their editorial assistance and to the anonymous referees for their helpfull suggestions. Also, we are grateful to Ivan Briz and Marco Madella for the corrections and suggestions.

References
