

Lost in the mountains? Marine ornaments in the Mesolithic of the northeast of the Iberian Peninsula

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¿Perdidos en las montañas? Ornamentos en concha en el Mesolítico del NE de la Península Ibérica

KEY WORDS: South-eastern Pyrenees, Mesolithic, "cultural landscape", *Columbella rustica*, Boreal.
PALABRAS CLAVE: SE de los Pirineos, Mesolítico, "Paisaje cultural", *Columbella rustica*, Boreal
GAKO-HITZAK: Pirinioetako HE, Mesolitoa, "Paisaia kulturala", *Columbella rustica*, Boreala.

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ABSTRACT

In recent years, modified Mediterranean marine shells (especially *Columbella rustica*) have been documented in Mesolithic sites in the Southern Pyrenees and Ebro Basin. Some scholars suggest that the presence of this gastropod allows us to identify a long-distance social network that created a common "cultural landscape". We introduce new data obtained in the South-eastern Pyrenean site of Balma Guilanyà. The chronometric and technical contextualization of this assemblage reveals the transformations that affected the technical, social and cultural spheres of the Postglacial hunter-gatherers from the South Pyrenees and Ebro Valley.

RESUMEN

En los últimos años se han documentado conchas marinas, principalmente de la especie *Columbella rustica*, en yacimientos mesolíticos situados al Sur de los Pirineos y en la Cuenca del río Ebro. Algunos investigadores sugieren que la presencia de *C. rustica* permite la identificación de redes sociales a larga distancia creando un paisaje cultural. En este artículo damos a conocer nuevos datos del yacimiento de Balma Guilanyà, en el SE de los Pirineos. Su contextualización temporal y técnica indica la existencia de transformaciones que afectaron desde el punto de vista técnico, social y cultural a los grupos de cazadores-recolectores del Posglaciar al sur de los Pirineos y en el Valle del Ebro.

LABURPENA

Azken urteotan, itsas maskorrak dokumentatu dira, *Columbella rustica* espeziekoak nagusiki, Pirinioen hegoaldeko eta Ebro ibaiaren arroko Mesolitoko aztarnategietan. Ikertzaile batzuen arabera, C. rustica ageri izanak adierazten du urruneko gizarte-sareak identifikatzen direla, eta, horren ondorioz, paisaia kultural bat sortzen dela. Artikulu honetan, Balma Guilanyà aztarnategiari (Pirinioetako HE) buruzko datu berriak jakinarazten ditugu. Aztarnategiaren denbora-testuinguruak eta testuinguru teknikoak adierazten dute transformazioak izan zirela, eta transformazio horiek Glaziar ondoko garaiko Pirinioen hegoaldeko eta Ebro Bailarako ehiztari-biltzaileei eragin ziela ikuspuntu tekniko, sozial eta kulturalari dagokionez.

1. INTERPRETING THE SIGNIFICANCE OF MARINE ORNAMENTS

There is a consensus that ornaments are identifiers that can be used to analyse the implications of "modern" behaviour. In fact, they are currently a proxy for tracking the dispersion of anatomically modern *Homo sapiens* during the upper Pleistocene throughout the Old World (White 2007). However, an attempt to integrate these artefacts into the study of the behaviour and social organisation of hunter-gatherers has a relatively short history. Since the beginning of Palaeoanthropology, ornaments have with a few exceptions, (see Taborin 1993), traditionally been treated as little more than curiosities, and sometimes their explanatory potential has even been questioned (Binford 1989).

This lack of interest has continued until relatively recent times. Perhaps the turning point came with the acceptance of a new theoretical agenda which coincided with a calling for an analysis of past cultural entities. From this perspective, personal ornaments are the key for reconstructing social dynamics of groups that lived in the past (Turner 1980).

In the Iberian Peninsula, although there is a long tradition of studying these artefacts, the recent synthesis by Esteban Álvarez-Fernández (2006) is essential for investigating aspects related with cataloguing, description and geographical distribution of ornaments from minerals, bones and shells. It is no exaggeration to say that this work opens new perspectives with which to analyse the social function of these indicators during the Upper Palaeolithic and Mesolithic.

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2. A "CULTURAL LANDSCAPE" IN THE NORTH IBERIAN MESOLITHIC?

In this article we discuss the hypothesis that a "cultural landscape" was consolidated in the northeast of the Iberian Peninsula during the Mesolithic in which artefacts, ideas and possibly people circulated (Barandiarán y Cava 1992). This notion has been explored by various authors, who have considered that the choice of *Columbella rustica* is a key attribute (Alday 2002, Cava 2004, Arias 2007).

In a similar vein, Álvarez-Fernández examines the importance of selecting this gastropod. His detailed catalogue shows that this ornament is frequent in Mesolithic settlements of the Ebro Valley, in contrast to the Cantabrian area where *Trivia sp.* is more common (Álvarez-Fernández 2006, 2007). Three clusters of settlements appear in the biogeographic region around the Ebro Valley; one located in the Upper Ebro Valley or Ribera Alavesa (Fuente Hoz, Mendandia, Atxoste, Kampanoste, Kampanoste Goikoa), other located on the southern slopes of the Western Pyrenees (Zatoya, Aizpea, Padre Areso, Peña 14, Legunova, Forcas II) and the last one located in Lower Ebro (Baños de Ariño, Ángel 1, Ángel 2, Botiqueria de los Moros, Costalena, Pontet and Margineda) (see postscript and appendix I). In 18 settlements included in this study, there are only two in which this gastropod has not been found, while this species has been documented in only one site belonging to the Cantabrian "cultural" area (Berroberria) (fig. 1).

A total of 116 marine shells have been recorded from the sites in the Ebro Valley, of which *Columbella* accounts for more than 60%. The assemblages are generally not very numerous (fewer than 5 items) and more than 10 are only recovered in a few cases. In practically all the sites, it is either the only species represented or is the most abundant, associated with other gastropods, bivalves and scaphopods, although these are always very scarce (Álvarez-Fernández 2006). The only sites in which *Columbella* has not appeared are Kampanoste and Mendandia, in the Upper

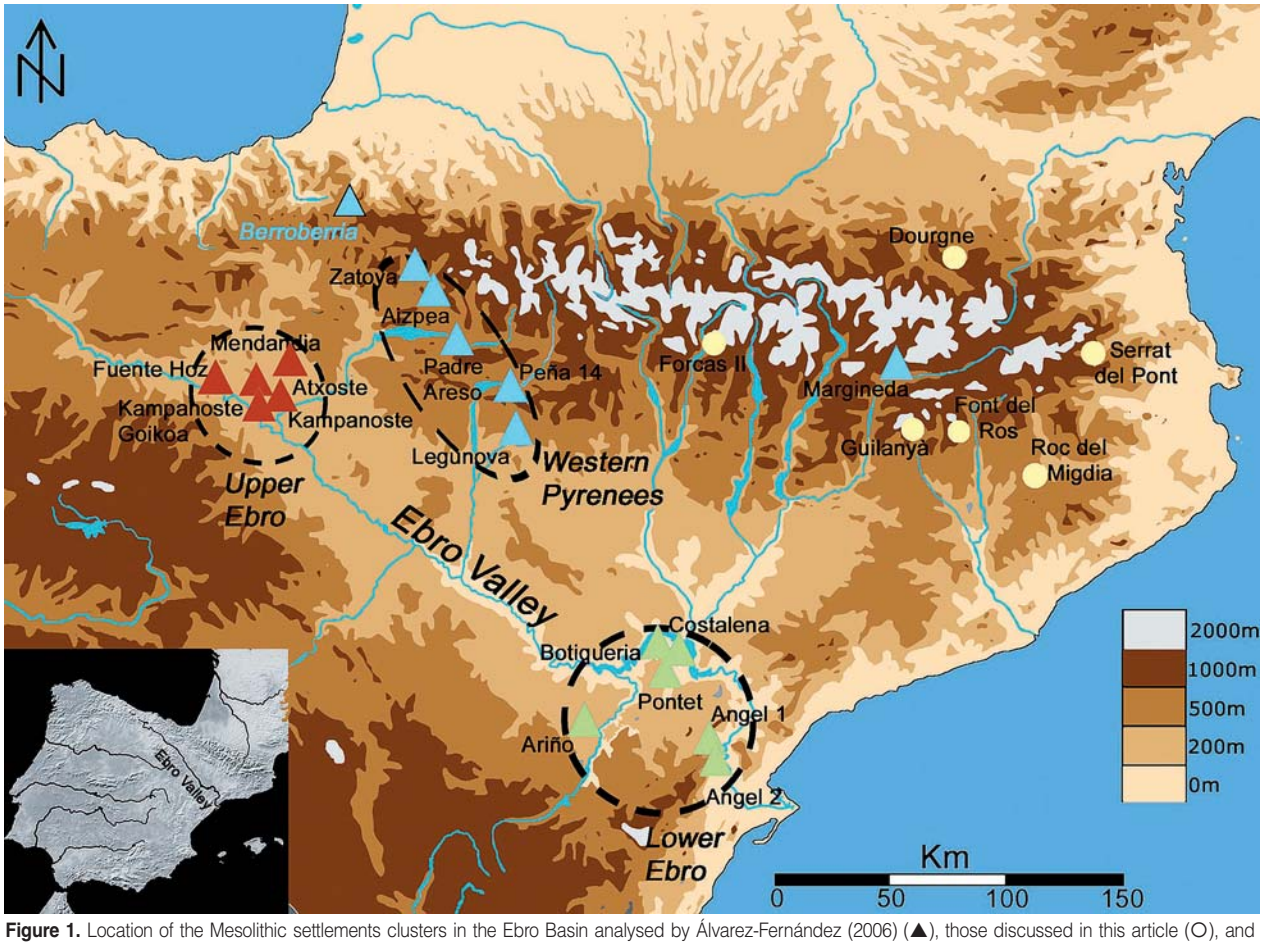


Figure 1. Location of the Mesolithic settlements clusters in the Ebro Basin analysed by Álvarez-Fernández (2006) (▲), those discussed in this article (O), and Berroberia (△) (the only "Atlantic" site with Columbella).

Ebro (fig. 1), where *N. reticulatus*, considered an Atlantic indicator, has mainly been recovered (Alday 2002).

A clear pattern emerges from this description: the circulation of *Columbella rustica* links the Mesolithic settlements of the Ebro Basin (Álvarez-Fernández 2008). This vector implies that this Mediterranean gastropod was transported, and its presence has been recorded in enclaves separated from the Western Pyrenees and the Ribera Alavesa by distances of more than 300 km from the present coastline (fig. 1). This pattern is not exclusive to this geographical area or this period. During the Upper Palaeolithic and Mesolithic of Western Europe, marine shells were transported over great distances, defining axes associated with the major European river basins (Taborin 1993, Álvarez-Fernández 2006).

Within this general panorama two anomalies emerge. The first is Berroberria, a settlement included within the Cantabrian area in which *Columbella* has been documented. However, this site is not far from the Western Pyrenees and Upper Ebro Mesolithic sites with which it offers important parallels (Cava 2004), so the presence of this Mediterranean ornament in an "Atlantic" context does not represent a problem.

The second case is Margineda (fig. 1). Its geographical position appears to define an isolated point that is difficult to relate with the Ebro Basin. This assemblage was not studied directly by Álvarez-Fernández, but was included on the basis of the information published (Guilaine and Martzluff 1995). This settlement has provided one of the most important assemblages of Mesolithic marine ornaments found in the Ebro Basin, which suggests regular contact with the Mediterranean (see appendix I).

3. CONSIDERING THE NOTION OF GEOGRAPHIC ISOLATION

The image of apparent "isolation" referred to in Margineda derives both from its geographical position and the cultural context ascribed to it, since this settlement is considered a clear example of the "facies of fortune" phenomenon. This concept describes a process of technical degeneration characteristic of the Postglacial lithic assemblages that have been documented in various settlements on the northern side of the Pyrenees which are ascribed to the Boreal chronozone (Dourgne c9, Adoutx, Cauna d'Arques, Roc d'en Bertran and Margineda c4) (Barbaza *et al.* 1984). The adaption to mountain ecosystems would have isolated these populations from the networks through which technical innovations circulated. This lack of contact was not restricted to techno-economic processes, but also affected life style and social organisation, resulting in them being cut off from the groups that settled in the Pyrenees.

In recent years we have been analysing the process of human settlement in the South-eastern Pyrenees, and a central focus of this project is the study of the variations observed in the Postglacial hunter-gatherers (Pallarés and Mora 1999). In this area, we have been able to recognise similar attributes to those of the north Pyrenean sites in which Margineda (in the south Pyrenees) indicates this process of isolation (Barbaza *et al.* 1984, Guilaine 1993, Guilaine and Martzluff 1995). On the basis of this observation, a question that arises is how to determine whether this process is geographically dispersed in a way that could be considered a possible territorial indicator. From this point of view, the assemblage of marine ornaments recovered in one of the settlements we are investigating in the South Pyrenees, Balma Guilanyà, will enable us to test the hypothesis of geographical isolation proposed for the Mesolithic hunter-gatherers in the Pyrenees (Martínez-Moreno *et al.* 2006, 2007).

4. BALMA GUILANYÀ: A SMALL ROCK SHELTER "LOST" IN THE PYRENEES

Balma Guilanyà is a small rock-shelter located at a height of 1150 m in a marginal valley of the southern Pre-Pyrenees. This geographical position supports the idea of Mesolithic settlements as "lost" places; however, several indicators contradict this picture. In this stratigraphic sequence two sedimentary units are differentiated, separated by a massive fall of rocks from the shelter's overhang. Several occupations have been documented in the upper level that have been dated to the Boreal and Pre-Boreal and; there two occupations in the lower level, dated to GI-1a and GI-1e (table 1) (Casanova *et al.* 2007).

The fall of the rock-shelter's overhang has sealed and separated the Late Glacial units from those of the Postglacial. This has prevented vertical migrations and/or their components being mixed up by post-depositional process and allows us to infer that these levels have a certain degree of contextual integrity. However, the vertical dispersion of these units, 15-20 cm thick, defines palimpsests that have been created by an indeterminate number of visits.

Level	Marine shells	# Lab	BP	Sample	cal BP (2σ)	Climatic zone
C	11 *Columbella* rustica	Beta-210730	8,640 ± 50	*Corylus*	9,740 - 9,500	B
	1 *Cyclope* sp.	Beta-185064	8,680 ± 50	charcoal	9,790 - 9,510	B
	1 *Acanthocardia* sp.	UBAR-368	8,970 ± 430	charcoal	1,250 - 9,050	PB/B
	7 *Antalis* sp.	Beta-186168	9,410 ± 60	charcoal	10,810 -10,490	PB
	9 nd.					
C1	2 *Columbella* rustica	Beta-210728	9,840 ± 50	Corylus	11,360 -11,160	PB
	5 *Antalis* sp.					
E	1 *Columbella* rustica					
	1 *Nassarius* reticulatus	Beta-210729	10,940 ± 50	Corylus	12,960 -12,840	GI-1a
	5 *Antalis* sp.	UBAR-367	11,460 ± 230	charcoal	13,800 -12,920	GI-1
EJ		Beta-185066	12,180 ± 50	charcoal	14,160 -13,920	GI-1e

Table 1. Archaeo-stratigraphic sequence of Guilanyà showing the malacological record, the BP radiometric series with its respective calibrated ranges Cal BP (IntCal04), and their assignation to the chronoclimatic events of the Late Glacial/Holocene.

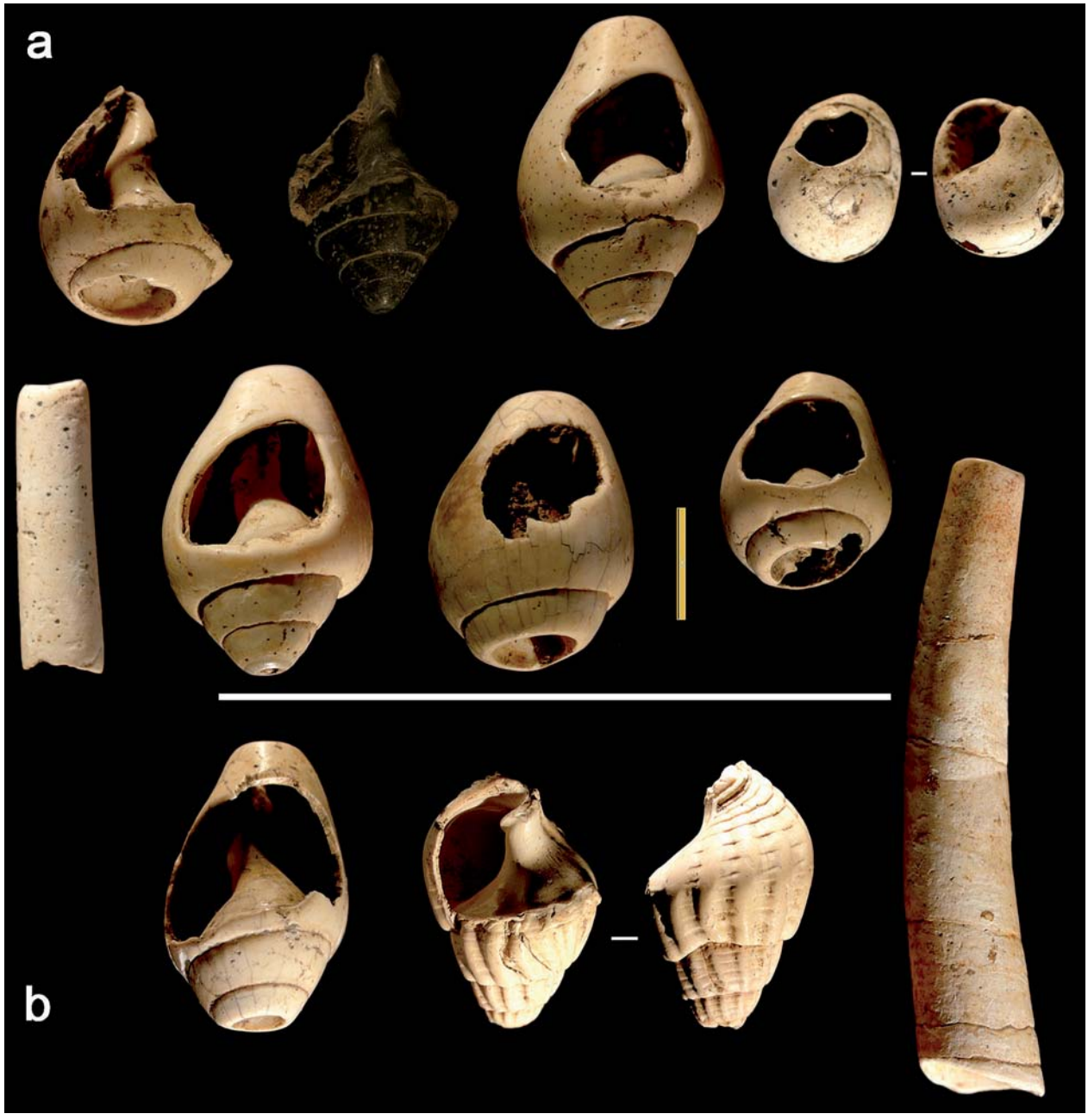


Figure 2. Columbella rustica, Cyclope sp. and *Antalis* sp. from Mesolithic levels of Guilanyà. In the lower part Columbella, Nassarius reticulatus and Antalis sp. from level E. (b) Note the intensely polished surfaces and the remodelling of (a) the perforations, which suggests a long use (graphic scale 5 mm).

The occupation of level C was particularly intense. Several ^{14}C AMS datings on charcoal and hazelnut shells allow us to determine that it is the result of an accumulation of visits between 10,800 and 9,500 cal BP (table 1). The anthracological record can be included in the Boreal chronozone.

Twenty-nine marine shells have been recovered from this level, and *Columbella rustica* is the most abundant species with 11 specimens. These are associated with several scaphopods (7), 1 broken fragment of *Acanthocardia sp.* with a hole on the apical edge, 1 perforated *Cyclope sp.* and several fragments of indeterminate bivalves. These remains were found scattered randomly over the area excavated. No precise relationships between them could be determined, so we think they were brought here at different times. Although we shall not analyse their attributes in detail here, we note that their surfaces are intensely polished, the perforations have been considerably remodelled and the apical area of some of them has been cut back (fig. 2). This suggests that they were attached for a long time to clothing or were part of ornaments before they were deposited in the settlement by chance.

Similarly, in level E, which correspond with GI-1a (or Allerod amelioration), several scaphopods were recovered with *Columbella* and 1 unperforated -but natural drilled- *N. reticulatus*. This find would suggest this gastropod would not be considered exclusively an "Atlantic" vector, and could have colonised the Mediterranean during the Upper Pleistocene. This is an interesting hypothesis, since the association of *Columbella* with *N. reticulatus* in various Mesolithic sites in the Upper Ebro valley is interpreted as the result of their collection from different marine basins (Alday 2002, Cava 2004). This observation should be analysed in detail at the assemblages of the South-eastern Pyrenees.

5. TRACING THE DISPERSION OF COLUMBELLA RUSTICA THROUGH THE SOUTH-EASTERN PYRENEES

The presence of *Columbella* is not restricted to this site, and can be traced through several Mesolithic settlements. We do not intend to build an exhaustive catalogue on the distribution of a very common gastropod on the northern side of the Pyrenees, and refer the reader to other works (Taborin 1993). However, we present some examples that indicate its dispersion through this region, focusing our attention on Margineda, Dourgne, Font del Ros and Roc del Migdia.

As we have noted, Margineda was included by Álvarez-Fernández thanks to published material (Guilaine and Martlzuff 1995). This rock shelter is located in the interior of the south face of the Axial Pyrenean massif at a height of some 1000 m a.s.l. (fig. 1). Twelve *Columbella* shells have been recorded in the Mesolithic level, c4, together with 2 gastropods classified as "Nassa". From the evidence published we think this attribution is incorrect, and that it is *Cyclope* sp. *Columbella* also appears in the early Neolithic levels.

Dourgne is a small rock-shelter located on the northern side of the Pyrenees at a height of some 700 m. a.s.l. (fig. 1). This settlement contains a long chronocultural sequence with several early Neolithic and Mesolithic levels and *Columbella* ornaments have been found in all of them. In one of the Mesolithic levels – c9 – 14 gastropods were recovered in the same square and have been interpreted as part of a possible necklace (Guilaine 1993).

Font del Ros is in the foothills of the sierras of the Eastern Pyrenees at about 669 m a.s.l. More than 1500 m^2 of this open air settlement were excavated, with several occupations being documented around a spring. The radiometric differences in different parts of the settlement suggest that this accumulation is the result of several visits over a period of 800 years (Martínez-Moreno *et al.* 2006, 2007). Three *Columbella* shells, perforated bivalves and scaphopods have been recovered from this site (Pallarés and Mora 1999).

The last site is Roc del Migdia, a rock-shelter adjacent to the southern Pyrenean environment that shares various attributes with the settlements discussed in this article, including an abundance of *Columbella* and other marine ornaments (*Trivia sp.*) (Oliva and Yll 2008). Some of these can be attributed to the Mesolithic, but the taphonomic problems detected in this shelter (Yll *et al.* 1994) make necessary their precise contextualisation, and some relation with very recent chrono-cultural periods cannot be discounted.

This quick review reveals that the selection of this gastropod as an ornament is a recurrent feature of these eastern Pyrenean settlements and these assemblages have stylistic attributes similar to those described in the sites of the Ebro Valley by Álvarez-Fernández (2006). The examples referred to imply distances from the Mediterranean coast of between 90 and 150 km. These similarities enable us to suggest that the settlements of the South-eastern Pyrenees could have formed part of that Mesolithic “cultural landscape”, while

permitting an axis to be traced connecting both sides of the Pyrenees with the Ebro Valley.

6. *COLUMBELLA RUSTICA* AND *FACIES OF FORTUNE*: TWO CONCURRENT PHENOMENA

The choice of *Columbella* as an icon of a social network that linked the populations of the Ebro Valley during the Mesolithic is a hypothesis that deserves to be explored. Two elements will enable the evaluation this statement: the techno-stylistic attributes of Postglacial lithic artefacts, and the chronometric range in which this ornaments appears.

As we have said, traditionally the "facies of fortune" documented on the North-eastern Pyrenees entails geographical isolation and social encapsulation (Barbaza *et al*, 1984). Alternatively, we suggest that the lithic assemblages of the South-eastern Pyrenees Mesolithic shares similar attributes, resulting of the remodelling the artefacts' organisational principles, generating a response based on the simplification of the technical design. In other words, these technical solutions were not exclusively functional responses conditioned by ecological factors (constrictions imposed by adapting to mountain *milieu*), and it does not represent a regressive cultural process (Martínez-Moreno *et al*. 2006, 2007).

Assemblages with techno-stylistic attributes that are no different from those described in the South-eastern Pyrenees are described in the settlements of the Lower Ebro, Upper Ebro and Western Pyrenees, although with their own specific characteristics derived from the availability of raw materials or activities carried out in those settlements (see contributions in Alday 2006). This suggests that the pattern detected in the South-eastern Pyrenees is dispersed over a wide geographic area vertebrated around the Ebro Basin.

Another aspect to be examined is the temporal dimension of this process. We assume that if it is an organisational response, it will be recorded in a similar temporal frame. At the same time, if this process can be found throughout this geographical area it would support the contention that this was a general pattern, not the result of specific adaptive situations. However, several factors make it difficult to carry out a radiometric evaluation: the differences in the number of dated occupations, the imprecision of many radiocarbon dates due to high standard deviations and problems related with their archaeological context, limiting the possibility to obtain a precise timeline.

As an alternative we propose grouping the radiometric records in which *Columbella* appears on the basis of geographical clusters: Upper Ebro, Western Pyrenees, Lower Ebro and South-eastern Pyrenees. The aim is to compare the ages of the ornaments and evaluate whether they represent a recurrent chronometric frame. In order to carry out this analysis the available radiocarbon dates were converted into calibrated ranges (cal BP) with 2σ following the IntCal04 curve contained in CalPal software (Weninger *et al*. 2006) (fig. 3).

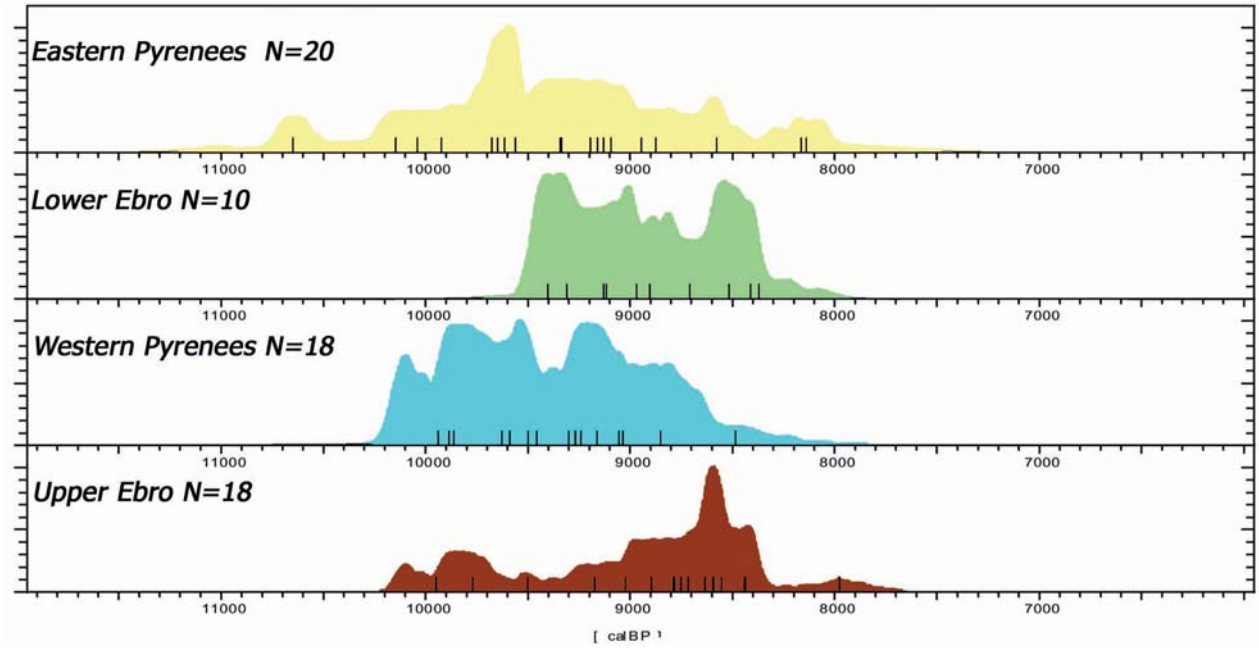


Figure 3. Chronometric distribution of the different geographical clusters where Columbella rustica has been detected, expressed in cal BP Ka.

This software enables these Gaussian distributions of irregular geometry expressed by the accumulation of probabilities of different dates to be displayed visually. This procedure enables these chronometric ranges to be compared by treating them as solar years. Broadly speaking, the graph produced from 66 14C radiocarbon datings shows that this ornament is *particularly* frequent between 10,000-8,500 cal BP. Chronoclimatically, these assemblages are positioned within the Boreal period, observation that coincides with the results obtained from the palaeoecological analysis carried out in these sites (see Alday 2006). We do not think it advisable to draw further conclusions, due the irregular quality of the radiometric record currently available.

The two hypotheses implied in our analysis suggest that *Columbella rustica* can be correlated with the technical situations originally described in the North-eastern Pyrenees (Barbaza *et al*. 1984). Their geographical dispersion and their persistence over time suggest that far from being adaptations to specific situations, they formed part of a technical and social tradition belonging to a particular spatio-temporal pattern. Moreover, these techno-complexes are recorded in other settlements within these geographical clusters, which we have not included in this article, within a similar temporal range (Alday 2006). At the same time, *Columbella* continues after 8.5 ka cal BP, and it is frequent during the final Mesolithic and early Neolithic (Álvarez-Fernández 2008).

From this point of view, the possibility that this ornament identifies a process that is not only recorded around the Ebro Basin becomes more compelling. Equally important is the trans-Pyrenean vector detected on the basis of the sites discussed in this article. The integration of this area is appealing since it expands the possible "cultural landscape" –or social network, as we prefer– that connects the Ebro Valley with the Rousillon-Languedoc and the Garonne Basin. This observation deserves to be analysed in future contributions.

7. DISCUSSION

Far from being isolated populations, Mesolithic people in the Ebro Valley and the South Pyrenees shared technical and symbolic elements that reveal a social network in which artefacts, ideas and possibly people moved. In this respect, *Columbella rustica* is an icon that traces the dispersion of the "cultural landscape" (Barandiarán y Cava 1992, Alday 2006, Álvarez-Fernández 2006, Arias 2007) that can be recognised in the north of the Iberian Peninsula.

Guilanyà and similar settlements describe the expansion of hunter-gatherers to be traced through the South Pyrenees, a process that is little known. The use of the mountain ecosystems has prompted various reflections since the supply of resources suitable for exploitation in these environments was severely restricted. The concurrence of various natural events meant that in these places the availability of abundant resources could be predicted, but were restricted to certain periods of the annual cycle. Seen in this way, recurrent occupation of these apparently isolated settlements depicts patterns of mobility that involved increased planning of subsistence activities (Gamble 1993).

We assume that these strategies continued for a long time in the eastern Pyrenees and could go back to the GI-1 interstadial, when Mediterranean ornaments and *Nassarius reticulatus* have been recorded in Guilanyà (fig. 2). These indicators open new perspectives when considering the history of the construction of that "cultural landscape" (or social network), which probably began in the Late Glacial period, a hypothesis we are currently working on (Martínez-Moreno *et al.* 2007). We suspect that precious information for understanding the behaviour of hunter-gatherers in the Late Glacial and Postglacial periods in Southwest Europe lies hidden in these small settlements "lost" in the mountains.

8. POSTSCRIPT

During the revision of this paper, new information has been published about the presence of *C. rustica* in two Mesolithic sites of the South-eastern Pyrenees and therefore they have been included in this paper: Forcas II (Álvarez-Fernández 2008) and Bauma del Serrat del Pont (Alcalde and Saña 2008) (see fig 1 and appendix I). Both sites share a techno-typological pattern and a chronological frame similar to the South-eastern Pyrenean sites mentioned in this paper. The implications of these new assemblages deserve to be discussed in future contributions.

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10. BIBLIOGRAPHY

ALCALDE, G., SAÑA, M. (eds.)
2008 *Procés d'ocupació de la Bauma del Serrat del Pont (La Garrotxa) entre 7400 i 5480 CAL aC*. Museu Comarcal de la Garrotxa. Olot.

ÁLVAREZ-FERNÁNDEZ, E.
2006 *Los objetos de adorno-colgantes del Paleolítico superior y del Mesolítico en la Cornisa Cantábrica y en el Valle del Ebro: una visión europea*. Ph.D. Universidad de Salamanca (Colección Vitor, 195), Salamanca.
2007 "Atlantic versus Mediterranean: Personal ornaments made from mollusc shells in Europe during the Upper Palaeolithic and Mesolithic". http://www.alexandriaarchive.org/.
2008 "The use of *Columbella rustica* in the Iberian Peninsula and Europe during the Mesolithic and Early Neolithic". In Hernánez, Soler and López (eds.): *IV Congreso del Neolítico Peninsular* (vol. II) Alicante, MARQ.: 103–111.

ALDAY, A.
2002 "Las unidades industriales mesolíticas en la alta-media cuenca del Ebro". *Complutum*, 13: 19–50.

ALDAY, A. (ed.)
2006 *El Mesolítico de muescas y denticulados en la cuenca del Ebro y el litoral mediterráneo peninsular.* Memorias Yacimientos Alaveses 11 Vitoria. http://dialnet.unirioja.es /servlet/ articulo?codigo=2260008

ARIAS, P.
2007 "Neighbours but diverse: social change in north-west Iberia during the transition from the Mesolithic to the Neolithic (5500-4000 cal BC)". *Proceedings of the British Academy,* 144: 53–71.

BARANDIARÁN, I., CAVA, A.
1992 "Caracteres industriales del epipaleolítico y neolítico en referencia a los yacimientos levantinos." In: Utrilla (ed.): *Aragón/Litoral mediterráneo: intercambios culturales durante la Prehistoria*: Zaragoza, Instituto Fernando el Católico. 181–196.

BARBAZA, M., GUILAINE, J., VAQUER, J.
1984 "Fondements chrono-culturels du Mésolithique en Languedoc occidental". *L'Anthropologie*, 88: 345–365.

BINFORD, L.R.
1988 "Isolating the transition to cultural adaptations: an organizational approach". In Trinkaus, E. (ed.): *The emergence of the modern humans:* Cambridge, Cambridge University Press. 18–41.

CASANOVA, J., MARTINEZ-MORENO, J., MORA, R.
2007 "Traçant l'ocupació dels Pirineus: Balma Guilanyà i els caçadors-recolectors del Tardiglaciar i l'Holocè antic al Prepirineu Oriental". *Tribuna d'Arqueologia 2006*: Dpt. Cultura-Generalitat de Catalunya. Barcelona 59–83.

CAVA, A.
2004 "Los "procesos culturales" del comienzo del Holoceno en la cuenca del Ebro y su contextualización". *Saldvie*, 4, 2004: 17–40.

GAMBLE, C.
1993 *Timewalkers. The Prehistory of global colonization.* Penguin Books. London.

GUILAINE, J. (ed.)
1993 *Dourgne. Derniers chasseurs-collecteurs et premiers éleveurs de la Haute-Vallée de l'Aude.* C.R.E.R. Toulouse.

GUILAINE, J., MARTZLUFF, M. (ed.)
1995 *Les excavacions a la Balma Margineda* (1979-1991). Ministeri d'Afers Socials i Cultura. Andorra.

MARTÍNEZ-MORENO, J. MORA, R., CASANOVA, J.
2006 "El Mesolítico de los Pirineos surorientales: una reflexión sobre el significado de las "facies de fortune" del Postglaciar". In Alday, A. (ed.): *El Mesolítico de muescas y denticulados en la cuenca del Ebro y el litoral mediterráneo peninsular, Vitoria*: 163–190.
2007 "El contexto cronométrico y tipológico durante el Tardiglaciar y Postglaciar de la vertiente sur de los Pirineos Orientales". *Revista d Arqueología de Ponent* 16-17: 7–44. http://rap.udl.es/ online/ rap 16_17.

OLIVA, M., YLL, R.
2008 "The use of marine shell in Cingle Vermell and Roc del Migdia, two prehistoric sites in western Mediterranean". In Alvárez-Fernández, E., Carvajal, D. (eds.): *2nd Meeting of the ICAZ Archaeomalacology group.*

PALLARÉS, M., MORA, R.
1999 "Organizational hunter-gatherer strategies in the IXth Milennium BP along the eastern Pyrenees". In: Thevenin (ed.): *Epipaleolithique et Mesolithique en Europe. 5º Congress International UISPP, Comision du Mesolithique, Grenoble 1995*: Paris, Ed. CHTS. 65–71.

TABORIN, Y.
1993 *La parure en coquillage au Paléolithique. XXIX Supplément "Gallia Préhistoire"*. CNRS. Paris.

TURNER, T.
1980 "The social skin". In: Cherfas, J., Lewin, R. (eds.): *Not work alone: a cross-cultural view of the activities superfluous to survival*: Beverly Hills, Sage. 112–140.

WENINGER, B, JÖRIS, O., DANZEGLOCKE, U.
2006 CalPal-University of Cologne radiocarbon calibration program package. http://www.CalPal.de.

WHITE, R.
2007 "Systems of personal ornamentation in the Early Upper Palaeolithic: methodological challenges and new observations. In: Mellars, P., Boyle, K., Bar-Yosef, O., Stringer, C. (eds.): *Rethinking the Human Revolution: New Behavioural and Biological Perspectives on the Origin and Dispersal of Modern Humans*: Cambridge, McDonald Institute for Archaeological Research. Cambridge: 287–302.

YLL, E., WATSON, J., PAZ, M.A.
1994 "Les darrers excavacions al Roc del Migdia: estat de la questió i noves perspectives". *Tribuna d'Arqueologia* 1993: Barcelona, Dpt. Cultura-Generalitat de Catalunya. Barcelona: 15–24.

11. APPENDIX I

Appendix I: Gastropod ornaments from Mesolithic sites discussed in the text. Key of geographic cluster is: Atlantic (A), Upper Ebro Basin (UE), South-western Pyrenees (WP), Lower Ebro Basin (LE), North-eastern Pyrenees (NEP), South-eastern Pyrenees (SEP) (see fig. 1). Data from; 1-Álvarez-Fernández 2007; 2-Álvarez-Fernández 2008; 3-Guilaine (ed.) 1993; 4-Guilaine and Martzluff (ed.) 1995 (modified); 5- Alcalde and Saña (eds.) 2008, 6- Oliva and Yll (2008). *Columbella rustica* in Forcas II is mentioned in Alvárez-Fernández (2008) *Trivia* sp., *Nassarius* sp. *Cyclope* sp. and *Columbella* are cited for Roc del Migdia (Álvarez-Fernández 2008, Oliva and Yll 2008); but in an unclear stratigraphic context.

Sites	Cluster	*L. obtusata*	*Trivia*	*N. reticulatus*	*Cyclope*	*C. rustica*	*Cerithium*	*Naticidae*	Reference
Berroberria	A		1			1			1
Fuente Hoz	UE	1	1			5			1
Mendandia	UE		1	5				1	1
Atxoste	UE			3		1		1	1
Kampanoste Goikoa	UE					2			1
Kampanoste	UE			18					1
Zatoya	WP					1			1
Aizpea	WP			1		5			1
Padre Areso	WP					1			1
Peña 14	WP					2			1
Legunova	WP					1			1
Forcas II	WP					*			2
Baños de Ariño	LE					3			1
Angel 1	LE					14	1		1
Angel 2	LE					3	1		1
Botiqueria Moros	LE					8			1
Costalena	LE					9	1		1
Pontet	LE		3			3			1
Dourgne	NEP					14			3
Margineda	SEP				2	12			4
Guilanyà	SEP				1	11			
Font del Ros	SEP					3			
Serrat del Pont	SEP					14			5
Roc del Migdia	SEP		* ?	* ?	* ?	8 ?			2,6

Appendix 1.