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# Postglacial Coast & Inland: The Epipaleolithic-Mesolithic-Neolithic Transitions in the Vasco-Cantabrian Region

## La Costa y el Interior en la Epoca Postglacial: Las Transiciones Epipaleolítico-Mesolítico-Neolítico en la Región Vasco-Cantábrica

**KEY WORDS:** Epipaleolithic, Mesolithic, Neolithic, Vasco-Cantabria, early Holocene.

**PALABRAS CLAVE:** Epipaleolítico, Mesolítico, Neolítico, Vasco-Cantabria, Holoceno inicial.

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### ABSTRACT

After the close of the Tardiglacial, when human settlement had extended high into the Cantabrian Cordillera and throughout the entire northern region of Atlantic Spain, dense early Holocene forests seem to have caused a major shift in human distributions involving at least substantial abandonment of the interior and concentration along the early Postglacial coast, especially near the newly created estuaries. This led to the formation of shell middens and simplified technologies that included the Asturian and other local adaptations to varying coastal substrata and resources between c. 9000-6000 radiocarbon years BP. Major changes again occurred with the late arrival of the Neolithic in this agriculturally marginal region of the Atlantic facade, not only in subsistence practices, but importantly also in ideology and settlement pattern, including the recolonization of the Cantabrian hinterland. This paper briefly reviews this archeological record in Asturias, Cantabria & the coastal Basque Country and discusses various models that have been advanced to explain it.

### RESUMEN

Después del final del Tardiglaciario, cuando el asentamiento humano se ha extendido alto en la Cordillera Cantábrica y a través de toda la región septentrional de la España atlántica, los bosques densos del Holoceno inicial parecen haber causado un cambio importante en las distribuciones humanas que incluía al menos el abandono sustancial del interior y la concentración a lo largo de la costa postglacial, especialmente cerca de los recién creados estuarios. Este hecho resultó en la formación de concheros y de tecnologías simplificadas que incluían el Asturiense y otras adaptaciones locales a los diversos substratos y recursos costeros entre aproximadamente 9000-6000 años BP<sup>14</sup>C. Luego hubo otros cambios mayores con la llegada tardía del Neolítico en esta región de la fachada atlántica tan marginal a la agricultura, no solamente en cuanto a las prácticas de subsistencia, si no también y de manera importante a la ideología y al sistema de asentamiento, lo cual incluía la recolonización del interior vasco-cantábrico. Este artículo repasa brevemente este registro arqueológico en Asturias, Cantabria y País Vasco costero y trata varios patrones que se han propuesto para explicarlo.

### LABURPENA

Glaziazio berantiarren bukaeran, giza finkapena Espainia atlantikoko iparraldean eta Kantauriko mendatean oso barneraturik zegoela, Holozeno hasierako baso itxiek gizakien banaketa aldarazi zuten antza, barnealdetik glaziazio ondoko aroaren hasierako kostaldeetan, gehienbat estuario sortu berrietan, kontzentratzera. Aldaketa hark K.a. 9000-6000 urte bitartean, radiokarbonoz eginiko datazioaren arabera, maskortegiak eta teknologia sinplifikatuak sortzea ekarri zuen, kostaldeko hainbat substratu eta baliabidetarako toki egokitzapenak eta egokitzapen asturiarrak barne. Alde atlantikoko eremu -nekazaritza zela-eta horren marginal- horretara Neolitikoa berandu iristearekin batera, aldaketa handiak gertatu ziren berriro ere. Aldaketa horiek ez zieten bakarrik biziraupenerako praktikei eragin, horiez gain, eta modu esanguratsuan gainera, finkapen patroiei eta ideologiari ere bai, Kantauri aldeko barne lurren birkolonizazioa barne. Artikulu honek era laburrean aztertzen du Asturias, Kantabria eta Euskal Herriko kostaldeko erregistro arkeologiko hori eta berau azaltzeko aurkeztu diren modelo batzuk aztertzen ditu.

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## INTRODUCTION

Study of the Late Paleolithic (i.e., Azilian), Mesolithic and especially the transition to the food production economies of the Neolithic in Vasco-Cantabrian Spain has long taken second place behind research into the rich and spectacular Middle and Upper Paleolithic record of this classic region. However, recent debates and discoveries of early Holocene materials have much to contribute to answering general questions of timing, process and cause in the differential adoption of agriculture and pastoralism throughout Europe, particularly concerning the issue of the "retarded" spread of Neolithic lifeways to many habitats of the Atlantic facade (e.g., ZVELEBIL & ROWLEY-CONWAY 1986; GONZALEZ MORALES & ARNAUD 1990; STRAUS 1991b; ZILHAO 1993; LUBELL *et al.* 1994), including Vasco-Cantabria.

## THE GEOGRAPHIC SETTING

Vasco-Cantabrian Spain, lying along the 43rd parallel of latitude, is divided among the autonomous administrative regions of Galicia to the west, Asturias, Cantabria (Santander) and Euskadi (Basque Country) to the east. As significant Late Paleolithic sites have only recently begun to be found in northern Galicia (e.g., LLANA *et al.* 1996), we will deal here only with the record from the central and eastern sectors of this distinctive, physically circumscribed macroregion.

The northern coast of the Iberian Peninsula, facing the Cantabrian Sea (a.k.a. the Bay of Biscay), has as its most distinctive feature the sharp altitudinal contrast between the often very narrow coastal landlands and the Cantabrian Cordillera, a western prolongation of the Pyrenean chain, which attains its highest elevations (up to 2650 m) in its central ranges and in the Picos de Europa massif, less than 40 km from the Holocene shore. To the south of the Cordillera lie the vastly different environments of the Castilian *meseta*, with elevations of generally c. 1000 m. The narrow region north of the Cordillera pertains to the Atlantic phytogeographic province, whereas the *meseta* and Ebro River basin to the south fall within the Mediterranean province. Between the shore and the Cordillera, there are parallel east-west coastal ranges in eastern Asturias and Cantabria and generally continuous foothills (often plunging directly down to the sea) with few major valleys in Bizkaia and Gipuzkoa. This translates into very steep relief, where even small plains are rare and restricted to limited sectors of the coastal

zone. The orientation of the whole area toward the north-northwest produces a high precipitation rate, with annual averages between 1000-1500 mm for most of the low and mid elevations and as high as 2000 mm in the mountains. This fact, along with the steep slopes, has caused significant erosion that has in turn formed a landscape with short, but fast-running rivers with deep, narrow valleys (Figure 1).

The sea and especially the presence of Rennell's Current, a branch of the Gulf Stream, under Holocene interglacial conditions create a mild oceanic climate, despite the region's relatively high latitude. Snowfall is very rare in the coastal zone, but, on the other hand, high summer temperatures seldom exceed the 20s°C. Holocene environments are, in short, equable, except in the high mountain chains, which today do receive significant snowfall, although there are no glaciers now as there had been during the Last Glacial.

## THE NATURE OF THE ARCHEOLOGICAL RECORD

When dealing with late Paleolithic, Mesolithic and even Neolithic archeological evidence from Vasco-Cantabrian Spain, there are several topics which should be considered before proposing behavioral interpretations of the record. These considerations of the nature of that record include:

- 1) processes of site formation, preservation versus destruction which have affected our perceptions of settlement distributions;
- 2) site visibility;
- 3) surviving site types and their contents;
- 4) the arbitrary nature of the traditional culture-stratigraphic unit constructs.

Our perception of site distributions in this region is strongly biased by the presence or absence of karstic limestone areas in which caves and rockshelters are common (e.g., the very significant difference between the eastern areas considered here versus Galicia and western Asturias). In this kind of location, the likelihood of preservation, as well as the probability of discovery, are much higher than in the open air. The role of caves as visible, high-yield archeological "containers" increases their chances of being easily recorded as sites in systematic survey and testing programs (e.g., STRAUS 1979a, 1990, 1997). Such has been the case over the 120 year history of prehistoric research in the Cretaceous and Carboniferous limestone areas of eastern and central Cantabrian

Spain. Nonetheless, some open air sites are known to exist (e.g., a few surface scatters found several years ago on the Sierras Planas coastal hills of eastern Asturias, Liencre & Kurtzio near the shore around the cities of Santander & Bilbao respectively, plus Oyambre & Hayas in western & eastern Cantabria respectively, Pareko Landa in eastern Vizcaya, & Ordunte in northern Burgos). To date, open-air sites have only rarely been found in the uplands for obvious reasons, namely the extremely steep slopes and high precipitation. The site of Peña Oviedo is an interesting exception. While acknowledging these bias factors, there is no doubt that our knowledge of sites is filtered by them; it is important to recall this fact to avoid creating too high a degree of confidence in our distribution maps and settlement system reconstructions.

Another factor that implies a notable distortion in our perception of settlement patterns is the rise in sea level. Our concept of "coastal site" is commonly based on the presentday shoreline, yet during the late Azilian/early Mesolithic (late Preboreal/early Boreal, c.9000-8500 BP), when the sea was still c. 30-20 m below its present level (TERS 1973), the coastal strip was as much as c. 1-3 km wider than today, depending on location.

This obviously means that most of the strictly "coastal" sites of the time are submerged today and are thus unknown to us.

Sites in the Vasco-Cantabrian region have usually been classified according to the traditional nomenclature developed originally in France. For the Postpaleolithic there is a certain amount of confusion because of the various uses of the terms "Mesolithic", "Asturian" and "Epipaleolithic" by different authors. The term "Asturian", defined by Vega del Sella in 1916, is applied both to middens composed mainly of *Patella* and *Monodonta* shells in caves in eastern Asturias and western Cantabria that usually contain cobble picks, and also to open-air surface artifact scatters that include the same supposedly diagnostic tool type. (Other coastal sites from the French Basque Country to Galicia and even Portugal have at times been given the "Asturian" label *in sensu lato* because of the presence of cobble picks in early Holocene context [see CHAUCHAT 1968; CLARK 1976,1983; MAURY 1977; GONZALEZ MORALES 1982].) The terms "Epipaleolithic" (generally used to apply to industries, such as the Azilian, technologically derived from the Magdalenian, including backed bladelets, curved and/or straight backed micropoints) and non-Asturian "Mesolithic"(generally defined by the

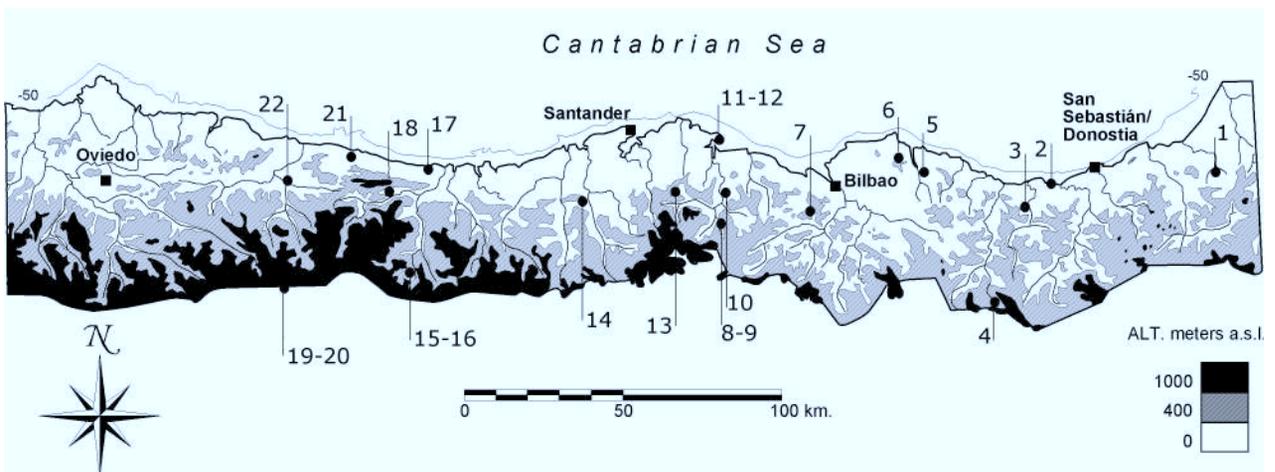


Figure 1. Legend. Principal sites mentioned in the text:

- |                  |               |                   |                 |
|------------------|---------------|-------------------|-----------------|
| 1. Berroberria   | 7. Arenaza    | 13. Cubio Redondo | 19. La Uña      |
| 2. Herriko Barra | 8. El Mirón   | 14. El Castillo   | 20. El Espertín |
| 3. Ekain         | 9. Tarrerón   | 15. Peña Oviedo   | 21. La Riera    |
| 4. Anton Koba    | 10. El Valle  | 16. La Mina       | 22. Los Azules  |
| 5. Santimamiñe   | 11. El Perro  | 17. Mazaculos     |                 |
| 6. Pareko Landa  | 12. La Fragua | 18. Los Canes     |                 |

Figure 1 by M. GONZALEZ MORALES.

presence of geometric microliths) have been also applied to coastal sites but with different malaco-faunal composition (notably dominated by *Ostrea* and *Tapes*) from the Asturian and without the cobble picks (e.g., GONZALEZ MORALES 1982, 1995). Epipaleolithic/Mesolithic artifact assemblages have also been defined at inland sites, especially at the eastern end of the region (the Basque Country) and the choice of which term to use is often a reflection of different research traditions more than anything else.

We are very conscious of the artificial and arbitrary nature of such terms as "Asturian" or "Azilian", and of the improbability of their direct correlation to actual socio-cultural groups of once-living people. We continue to use these terms pragmatically, however, as a convenient form of shorthand to facilitate communication among prehistorians, while reserving judgement on their "ethnic" reality beyond the technologically descriptive purposes for which they still have some manifest utility (see STRAUS 1985, 1987, 1991a).

## THE CHRONOLOGICAL FRAMEWORK

The list of radiocarbon dates for the terminal Pleistocene and initial Holocene has been growing rapidly in recent years. The first observation of interest is that most dates associated with Azilian assemblages range between c. 11,500 and 9,500 BP. There are however apparent overlaps between "Azilian" and "terminal Magdalenian" dates in the period between c. 11,800-11,500 BP-Alleröd-(or even up to 10,300 BP) and between "Asturian" and "Azilian" dates in the period between c. 9500 and at least 9250 BP (Preboreal), although some of these might be the result of semantic definitional differences, radiocarbon plateaux, sample contamination and/or lab errors (see STRAUS 1979b, 1991, 1992; GONZALEZ MORALES 1995). Most of the dated Azilian sites fall within the period of the Dryas III and Preboreal. Thus this tradition spanned warmer, colder and warmer climatic conditions, which, at any rate, witnessed the middle stages of overall regional reforestation, dominated (depending on the specific phase) by pine, birch, hazel and increasing proportions of the mixed oak community (e.g., DUPRE 1988)

During the millennium between 10,000-9000 BP there are six "Azilian" dates, two that are qualified as either "Mesolithic" or "Epipaleolithic" and one "Asturian" date. (A few of these "Azilian" levels-notably Ekain II & Arenaza IID both in the Basque Country-lack the diagnostic flat section

harpoon type and might therefore be more aptly labelled as "Epipaleolithic" or "Mesolithic".) The Azilian dates are concentrated in the middle of the millennium and correspond to 3 sites (Los Azules 3a & 3d, La Fragua 3, Ekain IV); the only exception is Cueva Oscura de Ania IIA (with typical harpoons) which has a date of 9280+/-230 BP. Between the cluster of Azilian dates at c. 9500 BP and Cueva Oscura is the date for the base of Level 3.3 in the Asturian *conchero* (shell midden, with cobble picks) in Cueva de Mazaculos: 9290+/-440 BP. But the large standard error makes problematic the apparent temporal overlap between the two industries. Nonetheless it is interesting to note the apparent similarities between the individual human burials at the inland Azilian cave site of Los Azules (Level 3d: 9540+/-120 BP) and at the coastal Asturian rockshelter site of El Molino de Gasparín (dug in 1926 and undated), both in eastern Asturias (FERNANDEZ TRESGUERRAS 1980; GONZALEZ MORALES 1982). There is a non-Asturian, non-Azilian "Mesolithic" date of 9260+/-110 BP from Level 1.3 of El Perro rockshelter in eastern Cantabria, which overlies two Azilian & a late Magdalenian levels (GONZALEZ MORALES 1995).

Recently, excavations in the Río Deva drainage of the Picos de Europa in western Cantabria by one of us (DIEZ CASTILLO) have revealed the presence of at least some human settlement of the montane interior during the late Preboreal/early Boreal. At La Calvera rockshelter (1120 m), Azilian-like lithic artifacts (small endscrapers, curved backed points) are associated with C-14 dates of 8950±50 (Level 4) & 8640±50 BP (Level 2) respectively. Charcoal from a posthole at the nearby 1250 m-high open-air site of Peña Oviedo (which also includes a major group of megaliths), associated with microlithic artifacts also of Azilian aspect, produced a radiocarbon date of 9290±50 BP. Also in the Liébana Valley, a collection of lithics (including short endscrapers & a curved backed point, but also a rectangle & 4 trapezes) from the Abrigo de la Mina (1000 m) has been characterized as "Azilian" (VEGA & HERRERO 1992), but there is no chronometric date for this site and the stratigraphic provenience of these finds is unclear. All these Liébana Valley sites are 50-60 km from the Holocene shore via the Deva gorge.

There is a non-Asturian, non-Azilian "Mesolithic" date of 9260±110 BP from Level 1.3 of El Perro rockshelter (eastern Cantabria, at the mouth of the Río Asón), overlying two Azilian levels and a late Magdalenian one (GONZALEZ MORALES 1995).

The evidence from El Perro is very interesting. First of all, this site dates in a continuous—and short—sequence the substitution of *Littorina littorea* (periwinkle) by *Monodonta lineata* (topshell) in eastern Cantabria, confirming what also occurred at this time in central-eastern Asturias, where this transition is well dated at La Riera Cave (STRAUS & CLARK 1986), for example. The date from El Perro 1.3 is approximately the same as that from Mazaculos 3.3. The Mazaculos shell midden continued to accumulate until 7000 BP, and the one in La Riera did so until 6500 BP.

There are only 12 dates between 9000 and 7000 BP (Boreal: full reforestation with hazel dominance), 6 of them from levels conventionally defined as "Asturian" and corresponding to 5 cave sites in eastern Asturias and east-central Cantabria (including the *conchero* in Cueva Morín, which lacks picks), plus open-air locations on the Sierras Planas of eastern Asturias and the ridgecrest of Hayas in eastern Cantabria. Between 7000-6000 BP (early Atlantic: climax mixed oak deciduous forest), coastal shell midden sites such as La Trecha and La Fragua in Cantabria and Bricia and La Riera in Asturias, are accompanied by a near-interior funerary site, Los Canes, which is 15-20 km from the shore near La Riera (depending on whether one goes directly across the c. 1000 m high Sierra de Cuera or via the valleys of the Ríos Casaño and Bedón) (Arias 1991). The 3 burials at this site were once considered to be the first evidence for the Neolithic in the area, as well as for continuity in funerary rites between the Mesolithic and Neolithic. AMS dates ranging between 6930-6265 BP, however, seem to situate the burials at a time far older than the first currently verifiable evidence for the Neolithic in the Cantabrian region.

Recently, information has been published about an apparent Mesolithic occupation in the cave of Urratxa III at 1015 m elevation in the Cantabrian Cordillera in south-central Vizcaya, near the border with Alava (MUÑOZ & BERGANZA 1997). Following a well-documented Azilian occupation dated to 10,240 BP, there seems to have been another (lesser?) use of this site with two statistically identical AMS dates of c. 6950 BP. Urratxa seems to have been a seasonally occupied site (with much flint coming from at least 40 km to the south in Treviño) where ibex hunting was a major activity, although other species were also killed including red deer, boar and aurochs. The site is only 55 air km. east-southeast of El Mirón in the Sierra de Gorbeia. Urratxa is a difficult 40 air km. from the seacoast at the mouth of the Guernica

estuary. Clearly, the mountains were not entirely abandoned even in the early Atlantic period despite dense forestation (see STRAUS & GONZALEZ MORALES 2003).

During the period between 6300-5750 BP (late Atlantic/postglacial optimum), there are a few dates of very different origin and geographical distribution. Near the coast of eastern Asturias is the cave of Les Pedroses with a *conchero* without cobble picks, where CLARK (1976,1983) obtained a date of 5930±185 BP, unassociated with pottery, which, however, had been found earlier elsewhere in the cave by F.JORDA in an unknown context. Then there is a cluster of sites with dates in this range in eastern Cantabria and Euskadi. One such date (5780±120 BP) comes from the small cave of Tarrerón in the Cordillera on the border between Cantabria and Vizcaya, with a small aceramic artifact assemblage originally considered to be Mesolithic (APELLANIZ 1971). There are 3 dates between 6240-5430 on different materials from a brecciated shell midden without ceramics in La Trecha Cave in coastal eastern Cantabria (GONZALEZ MORALES 1995). The cave of La Chora, between Tarrerón & La Trecha in the lower Asón valley, has produced a date of 6360±120 BP for a deposit overlying its terminal Magdalenian sequence (GONZALEZ MORALES 1995). A date of 5860±65 BP from Level 4 of Pico Ramos Cave in coastal western Vizcaya is associated with 2 lithic geometrics plus red deer bones, marine & terrestrial molluscs and birds (*Alca*) (ZAPATA 1995a,b).

Recently, one of us (RUIZ COBO) (RUIZ & SMITH 2001) has excavated a midden composed of landsnails (mainly *Cepaea nemoralis*—not the present-day common *Helix aspersa* [APARICIO 2001]) in Cubio Redondo Cave, located in the foothill range above the Asón valley not far from La Chora, about 20 km inland of the shore at El Perro or La Trecha and about 17 km northwest of the mountain site of Tarrerón. There are two divergent C-14 dates—one of 5780±50 on charcoal and the other of 6630±50 BP on bone—from this midden, which contains no ceramics. The small lithic collection includes a backed point, a circle segment with double-bevel retouch and débitage dominated by small flakes (with very few cortical pieces and only two small, exhausted cores of flint from the coast). Terrestrial fauna mainly include red and roe deer, chamois, boar and small carnivores (CASTAÑOS 2001). There are also bird remains, but it is unclear if they were killed or eaten by people (SANCHEZ 2001). The presence of 226 fragments of mussel shell and a limpet indicate contacts with

the shore. Since the two dates do not overlap even at two standard deviations, the existence of different visits to the cave widely separated in time and/or of mixing in the *conchero* would seem to be indicated for this late, but apparently non-Neolithic deposit. As Cubio Redondo is very small, it may have been occasionally used by people mainly based near the shore as a minor transit and/or short-term hunting camp in the foothill zone.

Some open-air sites have been attributed to the "Neolithic" solely on the basis of the presence of bifacial "Helwan" retouch and a significant presence of geometric microliths. Among these are Pareko Landa (Vizcaya) (LOPEZ QUINTANA 1997), the peat bog of Mouligna at Bidart (coastal French Basque Country/Labourd) with 2 dates of c. 5600 BP possibly associated with an Asturian-like pick and crude pottery (OLDFIELD 1960), and the site of Herriko Barra on the shore of western Guipúzcoa with an occupation level very rich in faunal remains and lithic artifacts and dated to 5810±170 BP (ALTUNA *et al.* 1988). The latter site has more than 2000 bone fragments, all of wild species (90% red deer), but no ceramics (MARIEZKURRENA & ALTUNA 1995). The only way in which these sites could be considered to be "Neolithic" is to qualify them as special-purpose camps where *only* hunting, gathering &/or fishing activities were practiced, as ZAPATA (1995a,b) has proposed to interpret Pico Ramos. But we are completely lacking evidence of associated domesticated animals, cultigens, ceramics, base camps or agricultural fields for the supposed food producers at these sites.

On the other hand, during this millennium, the first relatively credible Neolithic sites do begin to appear on the north side of the Cordillera (preceded by earlier ones in the upper Ebro Basin to the south and in French Aquitaine). In caves, the only examples are:

1) Marizulo in Guipúzcoa, where bones from Level I have been dated to 5285+/-65 BP and, although lacking in ceramics, yielded definite dog remains, plus 47 ovicaprine remains identified as domesticated by ALTUNA (1980), but apparently disputed by CASTAÑOS (1995), and

2) El Mirón in montane eastern Cantabria, where contiguous Levels 10 and 303.3 have produced plain ceramics of high quality, domesticated ovicaprines (studied by K. MARIEZKURRENA & J. ALTUNA) wheat (identified by L. PEÑA) and 4 radiocarbon dates of 5800-5600 BP (Straus & GONZALEZ MORALES 1998; STRAUS *et al.* 2002).

Starting as early as 5800-5500 BP, there is a coherent series of radiocarbon dates for megalithic monuments in Vasco-Cantabria. The oldest is 5810±290 BP from the tumulus of Larrate in Guipúzcoa (MUJICA & ARMENDARIZ 1991). Following this early outlier comes a more clustered set of dates: 5490±120 BP for the large dolmen of Hayas I near El Mirón, the necropolis of Karrantza where three shrines have dates close to those of Hayas (YARRITU & GORROTXATEGI 1995), 5500 ±100 BP for the mound & 5200±75 BP for the chamber of Boheriza 2, 5405±65 BP for the dolmen of La Cabaña. There are also later dates from Larrate (5070±140 BP) and from the nearby dolmen of Trikuaitzi (5250±140 BP) (MUJICA & ARMENDARIZ 1991), as well as from the dolmen of Peña Oviedo in the Picos de Europa of western Cantabria (5195±25 BP) (DIEZ 1996), and from two megaliths at Llaguna de Niévares (5175±25 & 5140±60 BP for Llaguna A and 5135±40 & 5110±60 BP for Llaguna D) (BLAS CORTINA 1995) and Monte Areo in central Asturias (5040±70) (BLAS CORTINA 1993). The fact that the dates span the second half of this millennium without breaks, clearly defines the first megalithic expansion throughout the whole region (see GONZALEZ MORALES 1992).

## THE LITHIC AND BONE INDUSTRIES OF THE AZILIAN

The most distinctive characteristic of Azilian material culture in comparison to that of the Upper Magdalenian is the reduction in tool type diversity (FERNANDEZ TRESGUERRES 1982; STRAUS & CLARK 1986). Lithic assemblages in the central and western sectors of the Cantabrian region are dominated by endscrapers on sort blades segments or flakes, especially "thumbnail" scrapers. Most of the other tool types are backed pieces, especially small bladelets and points, including the tiny curved backed "Azilian" points. Continuously retouched pieces, denticulates and scarce burins complete the repertory. There is relatively great use of flakes as blanks, although blades and especially bladelets were still produced.

In the Basque Country to the East, a series of levels, which may be early within the development of the local Azilian, still incorporate significant percentages of burins without a clear increase in the numbers of endscrapers (BERGANZA 1990; FERNANDEZ ERASO 1985). These data may show the existence of real regional variability that had its origins earlier in the Upper Paleolithic in the Basque Country versus west-central Cantabria and east-

central Asturias, possibly in part due to the very different lithologies (flint-rich versus flint-poor) of these two basic sectors (see STRAUS 1980,1996). The cultural sequence in Ekain Cave (Guipúzcoa), one of the more detailed for the Upper Magdalenian/Azilian transition, shows a progressive trend toward a more "Azilian" appearance, with a decrease in burins and a rapid increase in backed bladelets and points (ALTUNA & MERINO 1984), as is the case in other nearby caves such as Urtiaga.

A later stage of the Azilian seems to be represented at the cave of Piélago in central Cantabria, where the upper levels of the sequence (10,280±120 BP) produced some geometric microliths (triangles) made by use of the microburin technique. These never surpass 10% of the lithic tools, versus about 25% backed bladelets and another 10% backed micropoints (GARCIA GUINEA 1985). This trend toward the development of true microliths of Mesolithic form, also present (though rare) in the collections of some other Azilian sites, seems to be abruptly terminated by the abandonment of these caves as human sites until much later in prehistory (but then often as ossuaries rather than as living places).

Flat section, perforated antler harpoons are the most characteristic Azilian bone tools. Most have only 1-3 barbs on only one side. Only a few of them have any kind of decoration, aside from short marks on the base that may have had a technological function in hafting—the exceptions being a few nearly identical banded engraved harpoons from Los Azules and La Lluera, both in Asturias (FERNANDEZ TRESGUERRES & JUNCEDA 1994; FERNANDEZ TRESGUERRES 1982; FORTEA *et al.* 1990). FERNANDEZ TRESGUERRES has pointed out that the more than 100 harpoons from Los Azules—the most important Azilian site ever dug in terms of the length of its sequence and meticulousness of excavation—show formal development from elongated types with enlarged, non-perforated bases, quite in the fashion of their Magdalenian predecessors, to more typically short, perforated Azilian types. More generally, there was considerable reduction in number, variety and complexity of bone and antler implements in the Azilian relative to the Magdalenian. The few other such tools that are found include bi-pointed bones, often called "fish gorges" in the literature, antler and bone points with simple bases, bone awls and spatulae usually preserving the articular extremity of the original bones. Works of mobile art are virtually absent, although there are some examples of spatu-

lae with dentate geometric engravings in both terminal Magdalenian and Azilian contexts (GONZALEZ SAINZ 1989).

In summary, the overall image of Azilian industries is one of relative continuity from the late Magdalenian, but in an context of simplification in terms of implement diversity and complexity, in terms of traditional blade production, and in terms of decoration (see ADAN, GARCIA & QUESADA 1999 for a recent review based on the sequence from Cueva Oscura de Ania, Asturias).

### THE INDUSTRIAL EVIDENCE OF THE ASTURIAN

It is very difficult to compare the Azilian assemblages with those from Asturian sites. The contrast between the two is significant, at least at first glance: a lithic industry with a major microblade technology component (backed bladelets and points) and a very high density of retouched tools and flaking debris versus midden material almost completely lacking in any industrial evidence with the exception of some endscrapers, notches and denticulates (CLARK 1976,1983; GONZALEZ MORALES 1982). It is worth emphasizing that Mazaculos Cave, with several square meters of careful horizontal excavation of a thick shell deposit, only yielded about a half dozen retouched flake tools and about 300 pieces of flaking debris, without a single real bladelet. The recent excavations at La Llana (also in eastern Asturias) produced similarly small amounts of lithic flake artifacts (GONZALEZ MORALES 1996). Dominant types in Asturian sites are heavy-duty tools on quartzite cobbles, mostly picks and choppers.

All Asturian picks are highly standardized in their proportions, with an average length of c. 8.5 cm. Selection of an appropriate "blank" seems to be clear, as the original cobble directly determines tool size and proportions (GONZALEZ MORALES 1982). In the 80 years of research on the Asturian, numerous different functional explanations have been proposed for this tool. GONZALEZ MORALES agrees with the original suggestion of Vega del Sella that its use in intensive limpet collection seems evident on a number of grounds. First of all, the picks mostly appear to be associated with cave shell midden deposits, but they also do occur in open-air contexts such as at Oyambre in western Cantabria (where 21 picks were found in a small area) (RUIZ COBO 1992), at Liencres on the coast of central Cantabria and at Bañugues on that of central Asturias. At the latter site there are traces of a

former shell midden. Their distribution is strictly coastal. Wear traces and breakage patterns show that the pointed tip was the active part of the pick, as its very shape suggests.

Bone tools are also very scarce in the Asturian—even more so than in the Azilian. Remarkable, therefore, are the perforated antler *bâtons* found by VEGA DEL SELLA (1923) in the nearby caves of Fonfría and Tres Calabres in eastern Asturias (albeit in rather uncertain stratigraphic contexts) and the straight, bi-pointed "fish gorges" from La Riera, La Llana and Mazaculos in the same area. We could also mention some other crude bone points or sharpened bone splinters. These contrast with the Azilian is marked. Whether these differences could be at least partially explained by functional complementarity between coastal and inland sites will be discussed below.

As described above, there is also a series of penecontemporaneous sites containing industries called "non-Asturian Epipaleolithic" or "Mesolithic", with definitional problems especially regarding sites in the Basque Country. Indeed, true "Asturian" shell middens are not described in this area (or in eastern Cantabria), although there are some major shell deposits. The most notable of these was found early in this century in Santimamiñe (Vizcaya), with a lithic industry from which typical Asturian picks are absent but in which both flake and blade tools are found (ARANZADI *et al.* 1931; CAVA 1975). However, careful analysis reveals some apparent contradictions. First, most of the old collections from the Basque Country are practically useless, and some Mesolithic material from recent excavations is not published in detail. The combined collections from "Mesolithic" levels in the caves of Marizulo and Tarrerón (referred to above) amount to less than 60 retouched pieces, and the *richest* of them (Marizulo Level II) contains only 26 tools (CAVA 1978). The tools are dominated by continuously retouched pieces, notches, denticulates and endscrapers. The more laminar aspect of the débitage (relative to the Asturian) is no doubt related to the overwhelming use of flint in the flint-rich Basque Country versus quartzite which is so common in Asturias and western Cantabria. Even in the case of Santimamiñe, given the large volume of sediment excavated, tools are extremely scarce.

In all these levels, frequently described as "Tardenoisian-like" on the basis of their supposed chronological position and by an absence of "Asturian" characteristics, the problem of geome-

tric microliths remains. From reliable collections in the Basque Country other than those from recent excavations (e.g., Pico Ramos, Herriko Barra), there are only six geometrics from Santimamiñe (~1% of the tools) and only a single one from Tarrerón. Tardenois points are absent.

Recent work at El Perro rockshelter, at the mouth of the Río Asón in eastern Cantabria near the Basque border (GONZALEZ MORALES 1995; GONZALEZ MORALES & DIAZ 1992), confirms these observations. The disappearance of any kind of Azilian-like lithic artifacts at the top of the stratigraphic sequence in a relatively short time again poses the same kind of problem noted in our analysis of the industrial evidence from the Asturian *concheros*, and forces us to confront the difficulty of interpreting such a rupture in terms of conventional notions about the technological evolution of lithic and bone industries. The most striking difference between "eastern" and "western" coastal Mesolithic industries seems to be the lack of typical picks in the former sub-region's shell midden sites, perhaps suggesting that the molluscan species present there did not require a specialized lithic tool to be gathered. At Santimamiñe and El Perro, near the broad estuaries of the Guernica and Asón rivers, oysters, mussels and other sandy substrate species predominate—not the limpets of the rocky coasts near the classic Asturian sites. This correlation would seem to negate the proposal made 25 years ago by STRAUS (1979b) that the picks were used for digging vegetal resources along the littoral.

The bone and antler industry of the so-called "non-Asturian Mesolithic" is very sparse, with about 20 artifacts in total from all the sites. There are two perforated antler *bâtons* (one each from Logalán [western Vizcaya] & Los Canes caves), identical to the Asturian examples mentioned above, but, like them, they too lack clear provenience (ARIAS 1991). There are also some points, a spatula, and some sharpened bone fragments (awls?) from this period.

In summary, it is clear that the industries from sites or levels considered to be "Epipaleolithic" or "Mesolithic" from a chronological standpoint along the Cantabrian coast, show a high degree of similarity, in a context where the differences in terms of particular tool types are probably determined by raw material and malacofaunal variation and changes in the human use of the cave sites, as has long been argued by STRAUS (1979a,b,1980). Nonetheless, it is still true that a few microliths

are occasionally found in classic Asturian contexts, as suggested by STRAUS (1979b) and as recently shown by RUIZ (1992) at the open-air site of Oyambre near the estuary of San Vicente de la Barquera, western Cantabria. In general, however, *conchero* site contents do imply highly limited functions—not including much hunting and certainly not often with microlith-tipped or barbed arrows.

Returning to the beginning of this discussion, it now seems clear that, as the number of radiocarbon dates increases and if the date from Urriaga Azilian level C (8700±170 BP) can be dismissed, there is a distinct division between "Azilian" and "Asturian" complexes at c. 9300-9400 BP with little or no temporal overlap. On the other hand, although harpoons have not (yet) been found, Azilian-like assemblages from the upper Deva drainage of Liébana in the Picos de Europa have recently been described (DIEZ 1996). Two of them (Abrigo de la Calvera layers 2 & 4 and Peña Oviedo Cabin 2), excavated by Diez, have recently produced radiocarbon dates between 9300-8600 BP respectively, as noted above. By and large, however, the assemblages defined as "Azilian" by their industrial characteristics began to differentiate themselves from the Magdalenian during the first half of the XIIth millennium BP and had their maximum development in the XIth and first half of the Xth millennium. In its second half, geometric "Epipaleolithic" or "Mesolithic" assemblages began to appear in the archeological record. They persisted until and sometimes somewhat after the first evidence for important changes—not only in technologies, but also in economy and land use—appeared around 5800-5500 BP. Although the Asturian may not simply be a functional &/or seasonal facies of the *Azilian per se* (as originally argued by STRAUS [1979b]), its classic *concheros* may still not represent the sum total of human adaptations to the whole western sector of the Cantabrian region, even if inland sites are still scarce in the record for the IXth and VIIIth millennia BP.

## SETTLEMENT DISTRIBUTIONS

Azilian occupation sites are distributed according to a pattern very similar to that of the late Magdalenian. They include coastal sites such as La Riera, El Perro or La Pila (STRAUS & CLARK 1986; GONZALEZ MORALES 1995; BERNALDO DE QUIROS *et al.* 1992) and inland sites in mountain valleys such as El Piélago, El Rascaño, Portugain or Antón Koba (GONZALEZ ECHEGARAY & BARANDIARAN 1981; GARCIA

GUINEA 1985; BERGANZA 1990; ARMENDARIZ 1993). And Azilian settlement further extended the upward altitudinal expansion of human settlement that had been initiated during the Magdalenian with the Tardiglacial deglaciation, as shown by the recent discovery of apparently Azilian (or Epi-paleolithic) materials not only in Liébana (noted above), but also on the *southern* slope of the Picos de Europa in León: sites of La Uña & Espertín, the former with a harpoon fragment (BERNALDO DE QUIROS & NEIRA 1993). These facts seem to point to a model of land use that allowed these groups, with a similar, broadly shared technology, to exploit very different environments and to penetrate true highland, subalpine zones, apparently for the first time since the Last Glacial Maximum.

In this context, the archeological evidence for Asturian site (mainly shell midden) distributions obviously represents a sharp difference relative to that of the Azilian. It is almost strictly coastal, normally within 1-2 km of the present shore (the *conchero* farthest from the shore is Meré in eastern Asturias, at 7 km [CLARK 1983]). But inland, at least in Asturias and Cantabria, after about 8500 BP and before about 6000 BP, there is (as yet) no evidence of human occupation until the "dawn"(or "pre-dawn") of the Neolithic in this region. The sole exception seems to be the burials in Los Canes Cave in the intermontane valley between the Sierra de Cuera and Picos de Europa in eastern Asturias (mentioned above), with dates between 6900-6200 BP (ARIAS 1991). Azilian (or other) sites in the interior do seem to become scarce after c. 9500 BP, although increased survey and testing (like the recent work in Liébana) may change this picture.

Shell midden sites show a continuity in cave occupation in the coastal zone, a fact which also reveals a remarkable intensification in the use of this habitat, as indicated by a clear increase in the number of sites during the Asturian. Sometimes, as these *concheros* accumulated over time, the deposits eventually filled the cave entrances, thus precluding further use of the caves (VEGA DEL SELLA 1923,1930). Human occupation continued, however, in the proximity of these caves, perhaps because of the logistic advantages there locations offered relative to various resources (see STRAUS 1979b).

The shell midden at the non-Asturian site of El Perro in eastern Cantabria (9260 BP), as can be observed in remnant brecciated corniches on its walls and ceiling, was originally of very considera-

ble size, which would seem to indicate a certain length of use of the cave by Mesolithic humans, as is also the case with the Asturian site of Mazaculos (dated between 9300-7000 BP). The *conchero* at La Riera also yielded evidence for a long period of accumulation (8650-6500 BP) (CLARK 1976). El Perro and La Riera also show the undeniable stratigraphic superposition of shell midden material with very scarce industrial evidence atop one or several levels defined by varied lithic and bone assemblages as being typically Azilian, although to date they are the only incontrovertible examples of such a temporal order between the two "cultures". Classic Azilian deposits in inland sites, such as those of La Paloma, Los Azules, El Castillo, El Rascaño, El Salitre, El Valle and possibly the vast montane cave of El Mirón, do not seem to have been followed by Mesolithic occupations, although a few of them were used again during recent prehistory. While El Mirón, in the upper Asón valley (currently being excavated by GONZALEZ MORALES & STRAUS), has only traces of ephemeral early Mesolithic-age visits (Level 10.1: 9500-8400 BP), there are late non-ceramic cultural deposits in the nearby sites of Tarrerón and Cubio Redondo, as noted above.

In the Basque Country, we find a somewhat similar pattern, despite some apparent differences of detail (notably the absence of a true Asturian and a general scarcity of shell midden sites in general). However, from a geographic point of view, there is an important distinction which is related to the narrowness (and even local non-existence) of the coastal plain in this sub-region vis B vis Cantabria and Asturias. Azilian sites located in the mountains (Urratxa, Pikandita, Bolinkoba, Portugain and Antón Koba [BERGANZA 1990]) show no evidence of later occupation, and in this regard they mirror the trend toward inland abandonment described above for Cantabria and Asturias. Mesolithic sites are concentrated along the coast and are generally characterized by *concheros* or are at least rich in marine resources. Recent surveys are beginning to reveal open-air as well as cave sites (LOPEZ QUINTANA 1995).

Therefore, the main characteristic of sites dating to the beginning of the Holocene along the north face of the Cantabrian Cordillera, and extending up in time until the mid-Atlantic phase, is the concentration of human population in coastal areas and the effective abandonment of many areas and sites occupied though the Azilian in the interior mountain valleys.

## EVIDENCE OF SUBSISTENCED ACTIVITY

Both Asturian *concheros* and those of the Mesolithic of eastern Cantabria and the Basque Country exhibit an intensification of processes already evident in the Azilian and before (e.g., FREEMAN 1973; STRAUS 1977). The exploitation of marine resources (not only molluscs, but also sea urchins and crabs) increases notably, as the shell middens themselves clearly demonstrate. Fish remains are also abundant, even if probably heavily underrepresented in the collections from old excavations which are in the majority of our sample of Asturian sites (CLARK 1983). At Mazaculos, marine fish are represented by more than 20 species, while fresh-water species practically disappear, suggesting a drastic change in fishing practices that seem to be marked by the replacement of the harpoon by gorges. Fish are relatively abundant in the small *conchero* sample excavated by CLARK at La Riera (1983).

Macrobotanical remains recovered from Mazaculos, La Llana and El Perro indicate the presence of wood from numerous edible nut- and fruit-bearing taxa, in addition to acorns—oak being a dominant taxon in pollen diagrams and anthracological determinations from deposits dating to the Atlantic period and a major one already in the Boreal.

Hunted resources seem to decline in importance as marine resources increase, but the differences are only relative ones. For Mesolithic sites in general, red deer continues to be the dominant game species, as it had been in most Azilian and Upper Magdalenian assemblages. In Level 3.3 at Mazaculos, it constitutes about 70% of the NISP counts, followed by roe deer and bovines (probably aurochs), with boar being somewhat less important, together with single specimens of ibex and chamois. Red deer is absolutely dominant in all the *conchero* samples taken recently from La Riera (ALTUNA 1986). To date there is no real evidence from this period of specialized exploitation of alpine caprids, in clear contrast to the Azilian and Magdalenian. This is no doubt the case because most shell midden sites are found at low elevations in gently rolling terrain and because under wooded, temperate conditions, the chamois and especially ibex retreated back to the high, rocky mountain slopes, from which they had been driven under glacial conditions. Although Cubio Redondo is located in hilly terrain, it does not have an ibex-dominated fauna.

Indicators of seasonal use of caves and rockshelters during the Asturian are of particular interest when compared with the few we have for the Azilian (late spring/early summer at La Riera [ALTUNA 1986] and at Ekain [ALTUNA & MARIEZKURRENA 1984], spring, summer and also winter at Rascaño [ALTUNA 1981]). Most of the animals for whom age could be determined in Level 3.3 within the *conchero* at Mazaculos were very young individuals, killed in late spring or summer, according to a preliminary analysis by J. ALTUNA. There are no differences among the major species. On the other hand, oxygen isotope analyses of shells (*Monodonta* & sometimes *Patella*) by M. DEITH (1983; DEITH & SHACKLETON 1986; n.d.) show a marked pattern of winter exploitation for samples from the *concheros* at La Riera, Mazaculos 3.3, La Llana, Cordoveganes, El Toraletete, et al. There is no evidence of summer shellfish collection. With respect to vegetal resources that have been found in some of these middens, the acorns, hazelnuts and other edible nuts all ripen in fall. There are also some inland landsnail middens, such as in Cubio Redondo Cave, Los Canes Cave where abundant *Cepaea* has been reported, as well as the Azilian deposits at such sites as El Valle and El Piélago. The post-9000 BP *conchero* deposit in Cueva Morín, not far from the Bay of Santander, is composed of only marine molluscs (VEGA DEL SELLA 1921).

It seems evident from the above that Mazaculos (and perhaps other Asturian *concheros*) could have been used by people at different seasons of the year, although not necessarily (or likely) continuously, and only for shellfishing during the cold season. Mollusc gathering seems to have been a "tiding-over" strategy when other, better food resources were scarce. There may have been some differentiation among sites in terms of resource procurement. The location of most of the main *concheros* in ecotonal (coastal) situations might have facilitated efficient exploitation of a range of biotopes (the open shore, estuaries, streams, the narrow coastal plain of eastern Asturias/western Santander, the coastal hills & mountain chains) with a minimum amount of movement, as CLARK (1983) noted some time ago, following a pattern of short-range logistic mobility more than a residential one. On the other hand, it is likely that as mollusc resources (which were under intense pressure of human exploitation [ORTEA 1986], along particular stretches of coastline became depleted, bands would move laterally along the shore to other favored campsites, thereby adding to

the accretional accumulation of several shell middens over time. This would explain the definitely clustered distribution of *concheros* around particular inlets and estuaries.

Subsistence activities like those described above seem to have required a fairly limited tool kit (especially in terms of lithic elements): simple but specialized tools (cobble picks) for shellfish collection, as well as notches, denticulates and endscrapers for working hafts, handles, digging sticks and points made from abundant, easily accessible wood, plus baskets, nets, weirs (made of plant fiber, wicker, etc.) for gathering, fishing, birding and storage. The high incidence of very young and yearling ungulates (mainly red deer) could be accounted for by postulating hand-trapping or even netting associated with drives. The working of bone seems to have been limited to the production of simple bi-pointed fish "gorges", awls and spatulae, not requiring specialized stone tools such as burins. There is no hint of bone or antler weapon tips for hunting in the shell midden-associated artifact assemblages.

Although there seems to have been some degree of variability in shell midden content, it is questionable as to whether they were always merely dumps for bulk garbage disposal (GONZALEZ MORALES 1992 *contra* STRAUS 1979b). There are shell-rich layers (e.g., El Perro 2a, La Riera 27 & 28) with bones, Azilian artifacts and dates. Presumably they represent times when the caves were still actually occupied and receiving a greater variety of trash. Yet, although most Asturian *conchero* deposits seem to have fewer bones and artifacts (probably because there was often not enough head-room left in the caves for actual habitation), basal level 3.3 in Mazaculos included a clear habitation level with a hearth and associated bones, stone tools (including a pick and some quartzite flakes) and a fish gorge. The dump (without evident living floors) accumulated later in this site. But no one has ever found an open-air site that might be directly associated with the *concheros* in the caves (as originally suggested by STRAUS [1979b]), although CLARK (CLARK & RICHARDS 1978) *may* have found hints of such outside La Riera *if* the artifacts in his Trench A—including 3 picks—were *in situ*. Indeed picks are not only found in shell middens. This has recently been shown again by the radiocarbon-dated open-air site on the Sierra Plana de Borbolla, near but not adjacent to Mazaculos and with a similar lithic assemblage including picks (ARIAS 1991). This would suggest that the same simple Asturian industrial repertoire

is found in *both* cave and open-air contexts. Modern excavations of *concheros* do show that they indeed often have a very low incidence of artifactual material. This is true even in the case of the old excavation of the non-Asturian shell midden in Santimamiñe (Vizcaya), where the density can be estimated at most c. 25 per cubic meter. But this seems to be a general characteristic of most sites in this early Holocene period.

### AN ALTERNATIVE VIEW

The problem in dealing with the evidence for transformations during the Late Pleistocene/Early Holocene in northern Spain from the viewpoint of processual archeology is a good example of the limitations of a strictly functionalist perspective in order to explain change in terms of adaptation (see GONZALEZ MORALES 1991). In this region there was no marked substitution of Pleistocene faunas essential for human subsistence at this time (in contrast to the situation in France with the fairly abrupt extinction of reindeer, a critical species there but never significant in Spain) (e.g., STRAUS 1995, 1996b). Red deer remained the principal game species in the Mesolithic, across the Pleistocene-Holocene transition, as it had been in the Solutrean, Magdalenian and Azilian (except at specialized montane ibex-hunting sites). The progressive increase in woodlands beginning in the Bölling/Alleröd interstadial (interrupted somewhat even here by Dryas III) amounted to a major transformation of the Cantabrian landscape, climaxing in dense deciduous, mixed oak communities in the Atlantic period. But this did not cause a total or abrupt turn-over in major ungulate game species, other than an increase in roe deer and boar and a continued decrease in horse and bovines (among which aurochs replaced bison)—which had not been the mainstays of regional subsistence during the Late Upper Paleolithic anyway (ALTUNA 1995; STRAUS 1983; FREEMAN 1973). Although there was not a radical change in faunal composition, there may have been more of an emphasis on hunting solitary animals or very small groups in the newly wooded landscape (in which red deer would have behaved quite differently than in the open environments of the Late Glacial [STRAUS 1981]).

The continued diversification of resources and the spatial restriction of procurement areas (for both food and lithic raw materials [see GONZALEZ SAINZ 1991]) seem to be mainly unconnected with climatic change (see STRAUS & CLARK 1986), since these processes had been underway in this cir-

cumscribed, high-relief region since Solutrean times—probably for basically demographic reasons, i.e., progressive population packing (STRAUS 1977, 1983; STRAUS & CLARK 1986). Therefore, the trend toward increased gathering with overall growth in the use of marine resources cannot be strictly referred to as an adaptation to "new" conditions. Nor can the technological transformations be explained exclusively by physical environmentally deterministic hypotheses.

It is interesting to note that the complete disappearance of rock art and nearly total disappearance of portable art at the end of the Magdalenian has scarcely been considered in this context by processual archeologists (but see STRAUS 1992:216-7), maybe because "art" is considered as something different from "technology", "ideology" being less accessible across 10 millennia than pragmatic tools and bones—and presumably less directly concerned with the bread and butter issues of daily survival. Yet it is easy to see how one could mount a more holistic interpretation of the rapid decline in "artistic" activity in light of changes in social relations, territory size and organization, and subsistence practices, by combining aspects of both processual and post-processual archeology (see, for example, GONZALEZ SAINZ 1988).

A significant interpretive problem stems from the idea that hunting was the essential activity of *all* groups of European prehistoric foragers, perhaps as a result of the over-representation of lithic tool kits and *chaînes opératoires* in the archeological record. But the relative decline in the archeological visibility of hunting in the Mesolithic of northern Spain is not only linked to differentiation in the spatial organization of activities or the functional complementarity of sites. It may have been real and widespread (i.e., not just at the coastal shell middens). We must still resist the historical tendencies to see prehistory in terms of "progress" especially in terms of continuous improvement and innovation of weapons, and to somehow believe in the innate superiority of hunting as a mode of subsistence—and life—*vis à vis* gathering and fishing (with all the implications that this bias may have in terms of our perceptions of the sexual division of labor and the relative values of different presumed roles therein).

The evidence that we currently possess for the final Paleolithic and Mesolithic suggests restriction of movement by human groups, which relied more and more on local, sessile (or at least less mobile) resources. Intensification in resource

procurement meant diversification: exploitation of local foods such as terrestrial and marine molluscs, sea urchins, crabs, fish, birds, and plants, as well as hunting solitary, often small body-size animals, such as roe deer, in addition to continued hunting of red deer, but in smaller herds. This kind of process meant decreased contact among groups (especially distant ones) and less aggregation, potential conflict and ritualization. The role of dense woodlands by Boreal times in the abandonment (or at least lessened use) of the rugged Cantabrian interior, as movement became physically more and more difficult, needs to be considered. Even before that, however, the situation here was very different from that of the northern frontiers of the Late Upper Paleolithic world (e.g., terminal northern Magdalenian, Creswellian, Hamburgian, Federmesser, Bromme, Ahrensburgian, Fosna), which were in more or less continuous territorial expansion with continued high mobility and dependence on large reindeer and other mobile ungulate herds in still substantially open landscapes well after Dryas I.

The reduction in abundance and variety of stone and antler tools and the disappearance of all preserved decoration (even of the most rudimentary sort) after the Azilian (and of any animal representations after the late Magdalenian) seem to be related in the sense that there was less critical emphasis on hunting, as reflected both in the preparation of special, curated weapons and in ideology or symbol systems which mediated identification at the individual, group or intergroup levels. The social role of hunters was thus also probably changing rapidly.

## THE END OF AN ERA

In Tarrerón Cave, c.25 km from the coast of eastern Cantabria (APELLANIZ 1971), we know that at about 5700 BP, groups who visited the cave made trips to the shore (or *vice versa*), collecting a certain quantity of potentially edible shellfish to bring them to this montane site, perhaps evidence for a tradition of dependence on the sea. A single geometric piece (a crescent) has been reported from the very small lithic assemblage. At practically the same time, a group of people camped on the shore at Herriko Baro (now in the city of Zarautz), killed several red deer and left behind many geometric microliths (1/4 of the lithic assemblage), clearly suggesting that this was a hunting camp. The microliths include double-bevel backed ("Helwan" retouched) pieces, which are

supposed *Neolithic* indicators (MARIEZKURRENA & ALTUNA 1995). To the same period dates the shell midden in Pico Ramos Cave, near an inlet in western Vizcaya, again with no domesticated animals or ceramics (ZAPATA 1995a,b). The aceramic, inland landsnail midden at Cubio Redondo also dates to about this same time and has a "Helwan"-type retouched microlithic segment. Yet also as far back as 5800 BP, in the cave of El Mirón, near Tarrerón and Cubio Redondo, after an apparent post-Azilian occupational &/or depositional hiatus, there are levels (the oldest being Stratum 10–5690±50 & 5570±50 BP & Stratum 303.3– 5790±90 & 5550±40 BP) with numerous undecorated ceramic sherds and remains of domesticated (as well as some wild) animals (STRAUS & GONZALEZ MORALES 1997, 1998; ALTUNA & MARIEZKURRENA n.d.). Ceramic-containing levels 10, 9.6 and 9 in El Mirón have also yielded microlithic segments, one of which are made by Helwan retouch. Not too far from Herriko Barra in Guipúzcoa, Level I in the cave of Marizulo has yielded abundant marine molluscs and domesticated dog and possibly ovicaprine remains associated with a date of c. 5300 BP, unfortunately from a probably disturbed context (CASTAÑOS 1995 contra ALTUNA 1980).

A continuous series of dates from megalithic monuments also begins at about 5800 in the Basque County and soon thereafter in Cantabria and Asturias, as described above. The oldest of these funerary structures typically have microlithic trapezes, along with lithic industries of supposed Mesolithic derivation, but not in the Cantabrian sense. Thus, the new economic, industrial and ideological changes that came with the Neolithic seem to mark an authentic break with the preceding regional traditions, despite a possibly brief period of overlap c. 5800-5700 (see GONZALEZ MORALES 1992).

The usual idea we have of the Neolithic as a period of change from mobility to sedentism seems to be challenged here—as in other cases of Mesolithic groups along the Atlantic facade. In contrast, the evidence for a quick spread of the practice of megalithic-building from the coast into the high mountains (in cases above 1500 m in the Picos de Europa) shows a pattern of land use that implies a range of movement very different (greater) from that which we perceive for the Vasco-Cantabrian Mesolithic. And these new uses of the landscape, with apparent recolonization (or at least greater use) of the montane interior, are not linked to any observable climatic or resource crisis—particularly since they come *before* the end of the

Atlantic phase. The fact of the progressive rise in sea level, reducing the available space in the coastal zone, does not seem to be a suitable explanation, since this was a long-term process with very limited final effect, largely achieved by this time anyway in this region where the continental shelf is very narrow. So far at any rate, the known evidence from the sites does not show indications of resource stress or overexploitation.

The first pottery occurs in some sites in the western Pyrenees and Upper Ebro basin about 6500 BP (or even before [Alday 2003], and a Mediterranean origin is suggested for it, whether by trade, human migration and/or the spread of ideas. But, as in the cases of the Ertebölle middens of southern Scandinavia, the Mugian middens of south-central Portugal, or the Jomon forager culture of Japan, the presence of ceramics did not necessarily mean a fundamental change in the subsistence or other aspects of the lifeways of the Pyrenean & Upper Ebro Mesolithic populations. Along the Cantabrian coast, the first evidence of ceramics seems to be a single sherd from an unclear context in Los Canes Cave, but directly dated by AMS to 5865±70 BP (Arias 1995). This is followed soon after by Levels 10 & 303.3 in El Mirón Cave (discussed above) and Kobaederra in coastal central Vizcaya (ZAPATA *et al.* 1997). For some researchers with strong technological biases, pottery means "Neolithic", despite the lack of evidence for economic change. On-going analyses (including paleobotanical study of systematic flotation samples from El Mirón) will no doubt ascertain whether or not such evidence is present at these and other early ceramic sites. Although no cereal pollen has been found in the Neolithic palynological samples from El Mirón (M. J. IRIARTE, personal communication), cereal grains (wheats) have recently been identified from flotation samples all the way to the bottom of the Neolithic sequence in Stratum 303.3 (L. PEÑA, personal communication).

But the real change comes with the development of a different set of relationships between people and the land, as a reflection of different kinds of social relationships. The construction of the first megaliths suggests a significant break *vis à vis* the Mesolithic, showing the need, not only for cooperative work, but essentially the building of a cultural landscape marked by monumental, highly visible structures, often on hill- or ridgetops. Their topographic distribution also implies a range of mobility unknown in Mesolithic times. And this must be related to a new kind of exploitation of

the land relying significantly on herds of non-native domestic sheep and goats. This new, at least partially pastoral economy required a new reconquest of the uplands for pasture; it also required a new and different social organization and ideology.

Once again, there is no apparent evidence of population pressure or resource stress in the late Mesolithic that might explain the (tardy) adoption of food production economies and the new Neolithic way of life. Vasco-Cantabrian Mesolithic communities had, in fact, showed striking stability, succeeding to survive without archeologically visible changes in subsistence activities during some four millennia. This was quite a common situation for many other coastal (or riverine) foraging groups both in early-mid Holocene Europe (e.g., South Scandinavia, Portugal, Brittany, Scotland, Danube Iron Gates Gorge) and in the ethnohistorical past (e.g., the Fuegians). Nonetheless, this does not necessarily mean that there was similar stability in social relationships. The evidence (albeit slight) for an increase in funerary activity (i.e., more burials, some including grave goods, notably at Los Canes) relative to the whole Upper Paleolithic in the Cantabrian region, could be a limited reflection of some social tension within relatively sedentary Mesolithic groups.

As has been stated by JULIAN THOMAS (1991:127) with regard to the origins of the Neolithic in Brittany and the British Isles, this seems to have been "less a particular economy than a system of social reproduction, a set of structured social relationships." Here, as in Britain, "the paucity of evidence for economic practice presents a sharp contrast with the ubiquity of Neolithic field monuments", apparently without surplus-producing economies—which is not surprising given the marginal nature of the Vasco-Cantabrian environment *vis à vis* the cereal cultigens of Mediterranean origin that fed the original European Neolithic. As in northern Europe, the nature of the Cantabrian Neolithic was very different from that of LBK groups or of the Cardial Neolithic in the western Mediterranean regions. It lacked the classic diagnostic ceramic types, any (or at least abundant) cereals or characteristic houses. It still made use of caves for habitation. This was a "Neolithic which existed largely in the realm of ideas" (THOMAS 1991), and, for that reason, it was suitable for transmission across ecological boundaries by acculturation of local Mesolithic communities, rather than by colonization.

Attempts that have been made to refer the *direct* origins of the Cantabrian Neolithic to the Mediterranean, much in the fashion of old ideas concerning folk migrations and colonizations, would seem at least at present to be less parsimonious and less likely than an acculturation model, as is suggested by the fact that the spread of the Neolithic seem to have "halted" for several centuries to the south and east of the Mediterranean-Atlantic watershed which marks the ecological boundary between these two very different worlds. When the new ideas were finally adopted along the Atlantic facade, they did mark an abrupt change, but they came on the terms of the long-term Mesolithic inhabitants of that environment, which for Iberia is highly peculiar and to this day dominated by a pastoral way of life.

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## REFERENCES

- ADAN, G., GARCIA, E. & QUESADA, J.  
1999 El Aziliense de Cueva Oscura de Ania (Las Regueras, Asturias). *Espacio, Tiempo y Forma, Serie I*, 12, 215-267.
- ALDAY, A.  
2003 Cerámica neolítica de la región vasco-riojana: base documental y cronológica. *Trabajos de Prehistoria* 60, 53-80.
- ALTUNA, J.  
1972 Fauna de mamíferos de los yacimientos prehistóricos de Guipúzcoa. *Munibe* 24, 1-464.
- ALTUNA, J.  
1980 Historia de la domesticación animal en el País Vasco. *Munibe* 32, 1-163.
- 1986 The mammalian faunas from the prehistoric site of La Riera. In *La Riera Cave*, edited by L. STRAUS & G. CLARK, pp. 237-274, 421-480. Anthropological Research Papers 36, Tempe, Arizona.
- ALTUNA, J. & MARIEZKURRENA, K.  
1984 Bases de subsistencia de origen animal en el yacimiento de Ekain. In *El Yacimiento Prehistórico de Ekain*, edited by J. ALTUNA & J. MERINO, pp. 211-280. Sociedad de Estudios Vascos, San Sebastián.
- n.d. Restos de macromamíferos del yacimiento prehistórico del Mirón (Cantabria). Niveles con cerámica y Mesolítico. Unpublished manuscript.
- ALTUNA, J. & MERINO, J.  
1984 *El Yacimiento Prehistórico de Ekain*. Sociedad de Estudios Vascos, San Sebastián.
- ALTUNA, J., CEARRETA, A., EDESO, J., ELORZA, M., ISTURIZ, M., MARIEZKURRENA, K., MUJICA, J. & UGARTE, F.  
1988 El yacimiento de Herriko Barra y su relación con las transgresiones marina holocenas. In *Actas de la II Reunión del Cuaternario Ibérico*.
- APARICIO, M.  
2001 Malacofauna terrestre del yacimiento de Cubio Redondo. *Munibe (Antropología-Arkeología)* 53, 61-66.
- APELLANIZ, J.  
1971 El Mesolítico de la cueva de Tarrerón y su datación por el C14. *Munibe* 23, 91-104.
- ARANZADI, T., BARANDIARAN, J. & EGUREN, E.  
1931 *Exploraciones de la Caverna de Santimamiñe. 2ª Memoria*. Diputación de Vizcaya, Bilbao.
- ARIAS, P.  
1991 *De Cazadores a Campesinos*. Universidad de Cantabria, Santander.
- 1995 La cronología absoluta del Neolítico y del Calcolítico de la región Cantábrica. Estado de la cuestión. *Eusko Ikaskuntza. Cuadernos de Sección. Prehistoria-Arqueología*. 6, 55-80.
- ARMENDARIZ, A.  
1993 Antón Koba. *Arkeoikuska* 92, 190-193.
- BERGANZA, E.  
1990 El Epipaleolítico en el País Vasco. *Munibe (Antropología-Arkeología)* 42, 81-89.
- BERNALDO DE QUIROS, F., GUTIERREZ, C., HERAS, C., LAGUERA, M., PELAYO, M., PUMAREJO, P. & UZQUIANO, P.  
1992 Nouvelles données sur la transición Magdalénien supérieur-Azilien. La grotte de "La Pila". In *Le Peuplement Magdalénien*, edited by J. RIGAUD, H. LAVILLE & B. VANDERMEERSCH, pp. 259-272. CTHS, Paris.

BERNALDO DE QUIROS, F. & NEIRA, A.

- 1993 Paleolítico superior final de alta montaña en la Cordillera Cantábrica. *Pyrenae* 24, 17-22.

BLAS CORTINA, M.

- 1993 El monte Areo, la Llaguna de Niévares y la Cobertoria: tres espacios funerarios para la comprensión del complejo cultural megalítico en el centro de Asturias. In *Actas do Primeiro Congresso de Arqueologia Peninsular*, vol.2, pp.163-184. Sociedade Portuguesa de Antropologia e Etnologia, Porto.
- 1995 Destino y tiempo de los túmulos de estructura "atípica": los monumentos A y D de la estación megalítica de la Llaguna de Niévares. *Eusko Ikaskuntza. Cuadernos de Sección. Prehistoria-Arqueología* 6, 55-79.

CASTAÑOS, P.

- 1995 Revisión de las primeras fechas de domesticación en el País Vasco. *Eusko Ikaskuntza. Cuadernos de Sección. Prehistoria-Arqueología* 6, 135-140.
- 2001 Estudio arqueozoológico de la fauna del yacimiento de Cubio Redondo. *Munibe (Antropología-Arkeología)* 53, 71-74.

CAVA, A.

- 1975 La industria lítica de los niveles postazilienses de Santimamiñe. *Sautuola* 1, 53-73.
- 1978 El depósito arqueológico de la Cueva de Marizulo. *Munibe* 30, 155-172.

CHAUCHAT, C.

- 1968 *Les Industries Préhistoriques de la Région de Bayonne*. Unpublished doctoral dissertation, Université de Bordeaux I (Talence).

CLARK, G.

- 1976 *El Asturiense Cantábrico*. Bibliotheca Praehistorica Hispana 13, Madrid.
- 1983 *The Asturian of Cantabria*. Anthropological Papers of the University of Arizona 41, Tucson.

CLARK, G. & RICHARDS, L.

- 1978 Late and post-Pleistocene industries and fauna from the cave site of La Riera. In *Views of the Past*, edited by L.FREEMAN, pp.117-152. Mouton, The Hague.

DEITH, M.

- 1983 Seasonality of shell collecting, determined by oxygen isotope analysis of marine shells from Asturian sites. In *Animals & Archaeology*, edited by C.GRIGSON & J.CLUTTON-BROCK, vol.2, pp.67-76. British Archaeological Reports S-183, Oxford.

DEITH, M. & SHACKLETON, N.

- 1986 Seasonal exploitation of marine molluscs. In *La Riera Cave*, edited by L.STRAUS & G.CLARK, pp.299-314. Anthropological Research Papers 36, Tempe.

DIEZ, A.

- 1996 *Evolución del Poblamiento Prehistórico en los Valles del Deva y Nansa*. Unpublished doctoral dissertation, Universidad de Cantabria (Santander).

DUPRE, M.

- 1988 *Palinología Paleoambiente*. Servicio de Investigación Prehistórica de Valencia, Trabajos Varios 84.

FERNANDEZ ERASO, J.

- 1985 *Las Culturas del Tardiglacial en Vizcaya*. Universidad del País Vasco, Vitoria.

FERNANDEZ TRESGUERRES, J.

- 1980 El Aziliense en las Provincias de Asturias y Santander. *Centro de Investigación y Museo de Altamira, Monografías 2*, Santander.

FERNANDEZ TRESGUERRES, J. & F. JUNCEDA

- 1994 Los arpones azilienses de la Cueva de Los Azules. In Homenaje al Dr. JOAQUIN GONZALEZ ECHEGARAY, pp.87-95. *Museo y Centro de Investigación de Altamira, Monografías 17*, Madrid.

FORTEJA, J., CORCHON, M., RODRIGUEZ, M., HOYOS, M., LAVILLE, H., DUPRE, M. & FERNANDEZ TRESGUERRES, J.

- 1990 Travaux récents dans les vallées du Nalón et du Sella. In *L'Art des Objets au Paléolithique*, edited by J.CLOTTE, vol.2, pp.219-243. MinistPre de la Culture, Paris.

FREEMAN, L.

- 1973 The significance of mammalian faunas from Paleolithic occupations in Cantabrian Spain. *American Antiquity* 38, 3-44.

GARCIA GUINEA, M.

- 1985 Las cuevas azilienses de El Piélago y sus excavaciones de 1967-1969. *Sautuola* 4, 11-154.

GONZALEZ ECHEGARAY, J. & BARANDIARAN, I.

- 1981 El Paleolítico Superior de la Cueva del Rascaño. *Centro de Investigación y Museo de Altamira, Monografías 3*, Santander.

GONZALEZ MORALES, M.

- 1982 El Asturiense y Otras Culturas Locales. *Centro de Investigación y Museo de Altamira, Monografías 7*, Santander.
- 1991 From hunter-gatherers to food producers in northern Spain: smooth adaptive shifts or revolutionary change in the Mesolithic. In *Perspectives on the Past*, edited by G.A. CLARK, pp.204-216. University of Pennsylvania Press, Philadelphia.
- 1992 Mesolíticos y megalíticos: la evidencia arqueológica de los cambios en las formas productivas en el paso al megalitismo en la costa cantábrica. In *Elefantes, Ciervos y Ovicaprios*, edited by J. A. MOURE, pp.185-202. Universidad de Cantabria, Santander.
- 1995 La transición al Holoceno en la Región Cantábrica. In *Los Últimos Cazadores*, edited by V.VILLAVARDE, pp.63-78. Instituto de Cultura Juan Gil-Albert, Alicante.
- 1996 Memoria de los trabajos de limpieza y toma de muestras en los yacimientos de las cuevas de Mazaculos y El Espinoso (La Franca, Ribadeva) y La Llana (Andrín, Llanes) en 1993. *Excavaciones Arqueológicas en Asturias* 3, 65-78.

- GONZALEZ MORALES, M. & ARNAUD, J.  
 1990 Recent research on the Mesolithic in the Iberian Peninsula. In *Contributions to the Mesolithic in Europe*, edited by P.VERMEERSCH & P.VAN PEER, pp.451-461. Leuven University Press, Leuven.
- GONZALEZ MORALES, M. & Y.DIAZ  
 1992 Excavaciones en los Abrigos de la Peña del Perro. *Veleia* 8/9, 43-64.
- GONZALEZ SAINZ, C.  
 1988 Le fait artistique à la fin du Paléolithique. *Bulletin de la Société Préhistorique de l'Ariège-Pyrénées* 43, 35-62.  
 1989 *El Magdaleniense Superior-Final de la Región Cantábrica*. Tantín, Santander.  
 1992 Algunas reflexiones sobre las materias primas líticas y la variabilidad técnica y tipológica, al término del Paleolítico superior de la Región Cantábrica. In *Tecnología y Cadenas Operativas Líticas*, edited by R. MORA, X.TERRADAS, A. PAPPAL & C. PLANA, pp.57-72. Treballs d'Arqueologia 1, Bellaterra (Barcelona).
- LLANA, C., VILLAR, R. & LOPEZ-FELPTO, M.  
 1996 El yacimiento de A Pena de Xiboi. In *Estudios en Homenaje a Prof. Dr. CARLOS ALONSO DEL REAL*, edited by A.RODRIGUEZ, vol.I, pp.109-124. Universidade de Santiago de Compostela, Santiago.
- LOPEZ QUINTANA, J.C. & RUIZ DE GOPEGUI, M.A.  
 1997 Patrones de asentamiento en el Neolítico del litoral vizcaino. In *O Neolítico Atlántico e as Orixes do Megalitimismo*, edited by A.RODRIGUEZ CASAL, pp.335-352. Universidade de Santiago de Compostela, Santiago de Compostela.
- LUBELL,D., JACKES,M., SCHWARCZ,H., KNYF , M. & MEIKLE-JOHN,C.  
 1994 The Mesolithic-Neolithic transition in Portugal. *Journal of Archaeological Science* 21, 201-216.
- MARIEZKURRENA, K. & ALTUNA, J.  
 1995 Fauna de mamíferos del yacimiento costero de Herriko Barra. *Munibe (Antropología-Arkeologia)* 47, 23-32.
- MAURY,J.  
 1977 Typologie et Préhistoire de l'Asturien du Portugal. *British Archaeological Reports S-21*, Oxford.
- MUJICA, J.A. & ARMENDARIZ, A.  
 1991 Excavaciones en la estación de Murumendi. *Munibe (Antropología-Arkeologia)* 43, 105-165.
- MUYOZ, M. & BERGANZA, E.  
 1997 El Yacimiento de la Cueva de Urratxa III. *Cuadernos de Arqueología* 10, Universidad de Deusto, Bilbao.
- OLDFIELD, F.  
 1960 The coastal mud-bed at Mouligna, Bidart, and the age of the Asturian industry in the Pays Basque. *Pollen and Spores* 2, 57-68.
- ORTEA, J.  
 1986 The malacology of La Riera Cave. In *La Riera Cave*, edited by L.Straus & G.Clark, pp. 289-298. *Anthropological Research Papers* 36, Tempe.
- PEÑA CHOCARRO, L.  
 n.d. Neolithic, chalcolithic & Bronze Age plant remains from El Mirón cave: Evidence of the first farming communities in the Cantabrian region. Unpublished manuscript.
- RUIZ COBO, J.  
 1992 *Implantación y Desarrollo de las Economías de Producción en Cantabria*. Unpublished doctoral dissertation, Universidad de Cantabria (Santander).
- RUIZ COBO, J. & SMITH, P.  
 2001 El yacimiento del Cubio Redondo (Matienzo, Ruesga): una estación mesolítica de montaña en Cantabria. *Munibe (Antropología-Arkeologia)* 53, 31-55.
- SANCHEZ MARCO, A.  
 2001 Aves del yacimiento mesolítico del Cubio Redondo. *Munibe (Antropología-Arkeologia)* 53, 57-60.
- STRAUS, L.G.  
 1977 Of deerslayers and mountain men: Paleolithic faunal exploitation in Cantabrian Spain. In *For Theory Building in Archaeology*, edited by L.BINFORD, pp. 41-76. Academic Press, New York.  
 1979a Caves: a paleoanthropological resource. *World Archaeology* 10, 331-339.  
 1979b Mesolithic adaptations along the northern coast of Spain. *Quaternaria* 21, 305-327.  
 1980 The role of raw materials in lithic assemblage variability. *Lithic Technology* 9, 68-72.  
 1981 On the habitat and diet of *Cervus elaphus*. *Munibe* 33, 175-182.  
 1983 Terminal Pleistocene faunal exploitation in Cantabria and Gascony. In *Animals and Archaeology*, edited by J.CLUTTON-BROCK & C.GRIGSON, vol.1, pp.209-225. British Archaeological Reports S-163, Oxford.  
 1985 Chronostratigraphy of the Pleistocene/Holocene boundary: the Azilian problem in Franco-Cantabrian region (with comments & reply). *Palaeohistoria* 27, 89-130.  
 1987 Paradigm lost. *Helinium* 27, 157-171.  
 1990 Underground archeology: perspectives on caves & rockshelters. In *Archaeological Method & Theory*, edited by M.SCHIFFER, vol.2, pp. 255-304. University of Arizona Press, Tucson.  
 1991a Paradigm found? In *Perspectives on the Past*, edited by G.A.CLARK, pp.56-78. University of Pennsylvania Press, Philadelphia.  
 1991b The Mesolithic-Neolithic transition in Portugal: a view from Vidigal. *Antiquity* 65, 899-903.  
 1992 *Iberia before the Iberians*. University of New Mexico Press, Albuquerque.  
 1995 Diversity in the face of adversity. In *Los Ultimos Cazadores de los Tiempos Glaciares*, edited by V.VILLAVARDE, pp.9-22. Instituto de Cultura Juan Gil-Albert, Alicante.  
 1996a The use of quartzite in the Upper Paleolithic of Cantabrian Spain. In *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula*, edited by N. MOLONEY *et al.*, pp.37-42. *British Archaeological Reports S-649*, Oxford.  
 1996b The archeology of the Pleistocene-Holocene transition in SW Europe. In *Humans at the End of the Ice Age*, edited by L.STRAUS, *et al.*, pp.83-99. Plenum, New York.

## STRAUS, L.G.

- 1997 Convenient cavities: some human uses of caves and rockshelters. In *The Human Uses of Caves*, edited by C.BONSALL & C.TOLAN-SMITH, pp.1-8. *British Archaeological Reports S-667*, Oxford.

## STRAUS, L. &amp; CLARK, G.

- 1986 La Riera Cave. *Anthropological Research Papers* 36, Tempe.

## STRAUS, L. &amp; GONZALEZ MORALES, M.

- 1996 Preliminary excavations in El Mirón Cave. *Old World Archaeology Newsletter* 20(1), 14-18.
- 1998 The Río Asón Prehistoric Project: 1997 excavations in El Mirón Cave. *Old World Archaeology Newsletter* 21(1), 1-11.
- 2003 The Mesolithic in the Cantabrian interior: fact or fantasy? In *Mesolithic on the Move*, edited by L.LARSSON, H.KINDGREN, K.KNUTTSON, D.LOEFFLER & A.AKERLUND, pp.359-368. Oxbow Books, Oxford.

## STRAUS, L., GONZALEZ MORALES, M., GARCIA GELABERT, M. &amp; FANO, M.

- 2002 The Late Quaternary human uses of a natural territory: the case of the Río Asón drainage (eastern Cantabria Province, Spain). *Journal of Iberian Archaeology* 4, 21-61.

## TERS, M.

- 1973 Les variations du niveau marin depuis 10.000 ans, le long du littoral Atlantique français. In *Le Quaternaire. Géodynamique. Stratigraphie et Environnement. IX Congrès International de l'INQUA*, pp. 114-135. CNRS, Paris.

## THOMAS, J.

- 1991 *Rethinking the Neolithic*. Cambridge University Press, Cambridge.

## VEGA, M. &amp; HERRERO, M.

- 1992 Un nuevo yacimiento aziliense en Cantabria: Cueva de la Mina. *Actas del V Congreso Español de Espeleología*, pp.291-299.

## VEGA DEL SELLA, CONDE DE LA.

- 1916 *Paleolítico de Cuelo de la Mina*. Comisión de Investigaciones Paleontológicas y Prehistóricas, Memorias 13. Madrid.
- 1921 *El Paleolítico de Cueva Morín*. Comisión de Investigaciones Paleontológicas y Prehistóricas, Memorias 29. Madrid.
- 1923 *El Asturiense: Nueva Industria Preneolítica*. Comisión de Investigaciones Paleontológicas y Prehistóricas, Memorias 32. Madrid.
- 1930 *Las Cuevas de La Riera y Balmori*. Comisión de Investigaciones Paleontológicas y Prehistóricas, Memorias 38. Madrid.

## YARRITU, M.J. &amp; GORROTXATEGI, X.

- 1995 El megalitismo en el Cantábrico Oriental. Investigaciones arqueológicas en las necrópolis de Karrantza (Bizkaia), 1979-1984. La necrópolis de Ordunte (Valle de Mena, Burgos). *Eusko Ikaskuntza. Cuadernos de Sección. Prehistoria-Arqueología* 6, 145-198.

## ZAPATA, L.

- 1995a La excavación del depósito sepucral calcolítico de la Cueva Pico Ramos. *Munibe (Antropología-Arkeología)* 47, 35-90.
- 1995b El yacimiento arqueológico de la cueva de Pico Ramos. *Eusko Ikaskuntza. Cuadernos de Sección. Prehistoria-Arqueología* 6, 251-258.

## ZAPATA, L., GONZALEZ URQUIJO, J. &amp; IBAYEZ, J.

1997. El yacimiento de la cueva de Kobaederra (Oma, Kortezubi, Bizkaia): resultados preliminares de las campañas de excavación 1995-97. *Munibe (Antropología-Arkeología)* 49, 51-63.

## ZILHAO, J.

- 1993 The spread of agro-pastoral economies across Mediterranean Europe: a view from the far west. *Journal of Mediterranean Archaeology* 6, 5-63,

## ZVELEBIL, M. &amp; ROWLEY-CONWY, P.

- 1986 Foragers and farmers in Atlantic Europe. In *Hunters in Transition*, edited by M. ZVELEBIL, pp.67-93.