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The elusive flint: raw materials and lithic technology in the Mesolithic of eastern Asturias, Spain

Pablo Arias, Patricia Fernández, Celia Marcos and Irene Rodríguez

One of the classical traits of the prehistory of Asturias is the extensive use of other lithic raw materials as an alternative to flint. This feature, clearly related to the scarcity of this rock in the predominantly Palaeozoic landscape of the region, is characteristic of the Upper Palaeolithic tool kits. Yet it clearly increases during the Mesolithic when quartzite reaches a dominant position in the lithic assemblages. This paper presents the results of the current research on lithic raw materials in one of the key areas for the study of Iberian Mesolithic. The location of the main sources of stone supply is presented. The implications of the use of each major kind of raw material in the knapping technology and in the particularities of the local Mesolithic artefacts are also discussed. Some reflections on the relations of lithic raw materials with several aspects of social life (economic strategy, symbolism, etc.) are also offered.

Keywords: quartzite, quartz, chert, radiolarite, Azilian, Asturian, economy, symbolism.

Introduction

Although it might seem somewhat paradoxical, it is not unusual that key information on the study of the management of raw materials by prehistoric groups is provided by regions that are rather poor in those kinds of resources. The prehistory of eastern Asturias, on the northern coast of Spain, is indeed an excellent example. The landscape of the region, dominated by Palaeozoic rocks, is very poor in silicates, and when available the varieties are usually of poor quality, such as chert or radiolarite; in addition they frequently appear in small nodules. This has resulted in an extensive use, throughout prehistory, of alternative raw materials, especially quartzite, a rock that occurs very frequently in the Cambrian, Silurian and Ordovician strata of the region. In fact a high percentage of such a developed tool as the Solutrean point is knapped in this raw material (Straus 1983). Nevertheless, the indices of quartzite and other ‘alternative’ raw materials show important diachronic variability. In this paper we will study this issue during the first half of the Holocene, using the available information from Mesolithic contexts, especially detailed stratigraphic sequences such as La Riera (Straus and Clark 1986), Los Azules (Fernández-Tresguerres 1989) and Los Canes (Arias and Pérez 1995).

Availability of lithic raw materials in Eastern Asturias

The Geological basis

The region studied in this paper, Eastern Asturias, is located on the northeast edge of the Hesperian chain that constitutes the substratum of the Iberian Peninsula. The region is mainly constituted by Palaeozoic rocks (with ages ranging from the Middle Cambrian to the Upper Carboniferous (Alonso and Pulgar 1995) elevated by the Alpine orogeny of the Tertiary era and the Quaternary glacial and fluvial erosion configured the current relief, relocating part of the flints (Marquinez and Adrados 2000). Additionally, at both edges of the region
some small remains of Mesozoic basins are preserved; some accumulations of flint can be found there. The main varieties of rocks that were knapped at Prehistoric, especially Mesolithic, sites are the following (see Figure 128.1 for controlled sources of those raw materials):

‘Grey flint’

We have labelled as ‘grey flint’ a relatively fine-grained, greyish type that is quite frequent at some Mesolithic inland sites, such as Los Canes. As the nickname suggests, this flint is of greyish colour although its cortical part often appears as white with a thin, yellowish surface. This flint is found in the Barcaliente/Valdeteja formations (dated to the Serpukhovian/Bashkirian periods of the Upper Carboniferous).

‘Black flint’

We have given the name ‘black flint’ to a coarse variety of flint that breaks in a very irregular way when knapped. It is most frequent throughout prehistory in eastern Asturias and some areas of western Cantabria. As a matter of fact, it appears in the limestone of the above-mentioned Valdeteja and Barcaliente formations and is widespread in the region.

Radiolarite

Radiolarite, a coarse-grained reddish rock, is one of the most frequent lithic raw materials in Asturian prehistory. This rock appears in thin beds at the base of the Alba limestone, of Upper Tournaisian-Namurian A chronology.

Pendueles chert

This raw material is the only local flint that has been described in detail in the Geological literature (Martínez-García et al. 1971). An extensive use of this raw material has been described for the Neolithic and Chalcolithic contexts of Sierra Plana de la Borbolla, an open-air site located near the source, where Pendueles chert was selected for the elaboration of tools that might be considered quite simple from a technical viewpoint, e.g. endscrapers or splintered pieces (Arias 1990). So far it has not been found to be an important component of Mesolithic industries.

Cretaceous flint

Several amber and violet-coloured varieties, probably from Cretaceous rocks in western Cantabria, some 40km east of the region (Sarabia 2000), have been described at Mesolithic sites such as the Los Canes cave.

Quartzite

Quartzite is, for many local prehistoric periods, the
predominant raw material. Several varieties (mostly granulose, hard, greenish-grey coloured) are found at Mesolithic sites; most of them probably derived from the Barrios formation (Aramburu 1995), whose chronology ranges between the Middle Cambrian and the Lower Ordovician (Arenig). However, the high frequency of cortical \( \beta \) flakes suggests that this raw material was gathered as cobbles from secondary alluvial deposits, a fact that is documented in the region since the Mousterian (Manzano et al. 2005).

Quartz

Finally, some transparent quartz crystals were also used by Mesolithic groups. They appear in small cobbles, or even isolated crystals, and probably came from the Carboniferous rocks or some secondary deposits.

Surveying sources of lithic raw materials

In 2005 an extensive program of surveying was carried out by one team member (P. Fernández), and this allowed us to recognize in the field the varieties described above, and to make preliminary macroscopical comparisons with the knapped materials recovered at the Mesolithic sites. The most interesting sampled sources were the following (Figure 128.1):

Asiego I

At this site, located on the southern slope of the Cuera range, 600m asl, J. R. Bahamonde found a primary source of ‘grey flint’. The raw material appears in tabular bands with numerous irregularities ranging from 15 to 30cm. Its position is oblique as it is included in a thrust fault that has not been eroded at its basal part. In relation to the local rock it is relatively consolidated, without external fossils, and is fairly difficult to extract.

Asiego II

Near the village of Asiego, in a secondary deposit of Stephanian chronology, we found plaquettes of ‘grey flint’.

Arenas de Cabrales

Another secondary source of ‘grey flint’ was found by Pedro Sarabia in the Stephanian layers of the Puentellés formation (Fernández 1995), east of the town of Arenas de Cabrales.

Arangas

A source of radiolarite was sampled 2km from the hamlet of Arangas, in the Alba limestone formation (Upper Torunaisian-Namurian A).

Oceño

A sample of quartzite cobbles was taken from the terraces of the River Cares near Oceño.

Mier

Another secondary source in the alluvial deposits of the

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Figure 128.2. SEM elemental analysis of samples of lithic raw materials from the Mesolithic layers of Los Canes cave (Q = quartz, C = calcite, D = dolomite).
The elusive flint: raw materials and lithic technology in the Mesolithic of eastern Asturias

Cares valley was found near the hamlet of Mier. Black flint, quartz and quartzite have been found there.

La Candaliega
This terrace of the river Cares has provided black flint, quartz and quartzite.

San Antolín I
A sample of quartzite cobbles was taken from a terrace close to San Antolín beach, on the present seashore.

San Antolín II
We sampled another source of radiolarite, 500m east of the above, in the Alba limestone. In this location it appears in small nodules with a whitish cortex, dyed by the reddish colour of the clay.

Pendueles
This source is located on the beach at Pendueles. It is a layer of chert, some 40m thick, constituted of spongiaires spiculae. It is located above the ‘Montaña’ limestone (Barcaliente and Valdeteja formations) of Upper Namurian/Lower Westphalian chronology (Martínez-García et al. 1971).

Characterization of raw materials
The samples described above have been characterized using mineralogical techniques. X-ray power diffraction has been used to identify the crystalline phases that are present in the raw materials, and with this aim the samples were finely powdered. The identified components were quartz in the ‘black flint’ and the Cretaceous flint, and quartz and carbonates (calcite and dolomite), in minor proportions, in the other materials. A scanning electron microscope (SEM) was used to take images of the texture of the samples and to analyse the elements in atomic percentages present in them. The results of the analyses are shown in Figure 128.2. It can be observed that they corroborate the phases previously identified in the samples. Some differences among samples of the same raw material have been observed: in the case of ‘black flint’, although in sample M7 quartz forms the substratum, with isolated grains of calcite and dolomite on it, sample M1 is formed only by quartz. Samples M2 and M5 (Cretaceous flint) are also formed by quartz. Sample M3 (‘grey flint’) is constituted of quartz, calcite and dolomite. Regarding radiolarite, in sample M6 quartz forms the substratum, with calcite on it (Figure 128.3b), while sample M4 is formed of quartz and phyllosilicate (Figure 128.3a).

Management of lithic raw materials
One of the traits defining the transition from the Late Palaeolithic to the Mesolithic in south-west Europe is the increase in the use of local rocks. Since this fact was first clearly stated (Clottes and Simonnet 1979), several regional studies have confirmed that during the Late Magdalenian and the Azilian there is a shift towards the exploitation of sources of raw materials close to the prehistoric settlements (González Sainz 1989; Demars 1992). In the case of eastern Asturias this can be observed in some stratigraphic sequences, such as at La Riera, Los Azules, or Los Canes. The most detailed information published so far comes from the site of La Riera (Straus and Clark 1986), near the present-day coast. Quartzite is the predominant type of raw material in most of the sequence, although important diachronic changes can be observed (Straus et al. 1986). After some variability in the earliest, quite poor layers 1–5, in the Solutrean levels quartzite shows percentages of around two thirds in the number of artefacts and three quarters in weight. In the Magdalenian (levels 18–24) there is an important increase in flint indices, which reach 64.6% (weight) and 82.2 (number) in layer 19/20. Then a new inversion occurs, and in the latest Magdalenian level (25) and the Mesolithic layers (26 to 30) quartzite
is again the most frequent raw material. Local varieties of flint (including radiolarite – type A in the report – and ‘black flint’ – type C – appear from the Magdalenian layers, and their representation increases in the Azilian and Asturian assemblages, especially in the latter where the low percentage of flint (29.4% for layer 29 and 33.3% for 30) corresponds to radiolarite and, to a lesser degree, ‘black flint’.

For the Asturian period (the local coastal Middle and Late Mesolithic, dating to c. 8000–5000 cal BC), La Riera is no exception. Quartzite is the predominant raw material in all the sites of this technocomplex, with roughly three quarters of all the knapped materials (including the characteristic Asturian picks, which are nearly always made in this raw material), whereas flint (mainly radiolarite and black flint) only accounts for around 10% (Arias 1991). There is even a fairly high index of rocks that are not particularly suitable for knapping, such as sandstone and limestone; they correspond mainly to coarse cobble tools such as choppers or anvils, which are quite frequent in the Asturian shell middens.

It is interesting to highlight that during the Asturian a particular technique of knapping quartzite was developed, the so-called ‘técnica del NUPC’, meaning ‘unidirectional cortical platform core technique’ (Arias 1987). This technique results in quartzite items that may resemble choppers, yet they are in fact cores knapped in a way not very different from that used in the preparation of the Asturian picks. A quartzite cobbles, some 10–15cm long, is knapped with a hard hammer, hitting always in the cortical surface. The products are cortical backed knives with a shape similar to an orange segment, a lithic item that is very frequent in Asturian contexts.

For the interior part of the region, the available information comes from one site located in the valley of an important river (Los Azules), and three caves in mountain areas (Los Canes, Arangas and El Espertín). In Los Azules, the most important Asturian site in the whole Cantabrian region, the diachronic changes seem to be more complex than in La Riera. In fact quartzite is more frequent in the Upper Magdalenian layers (43.26% for layer 7; 54.35% for layer 6) than in the Azilian (layer 5: 24.24% layer 3: 48.23%), and the only clear tendency seems to be the reduction in the percentage of quartz (Fernández-Tresguerres 1989). Yet if we take into account the involved varieties of flint, the situation changes, and the tendencies of the management of raw materials are similar to La Riera. Fernández-Tresguerres (1989) stresses that radiolarite appears in the last Magdalenian level (layer 6) and increases dramatically in the Azilian. Thus, if we add quartzite to radiolarite, then a consistent trend towards a more frequent use of local, bad quality, raw materials arises: Layer 7; 43.26%; layer 6: 59.12%; layer 5: 55.14%; layer 3: 83.43%. As we can see, what happens in the transition of Magdalenian to Azilian is a change in the type of predominant ‘bad’ raw material (from quartzite to radiolarite), and in Late Azilian (layer 3), a new increase in the index of local material. It is interesting to highlight that there is a meaningful increase in the percentage of local rocks for two of the most important tool types in the Azilian: endscrapers and backed bladelets. The former rise significantly from 9.69% on local rocks in layer 6 to 32.97% in layer 5, whereas the latter increases from 4.16% to 30.30%. Most of the increase is due to the overwhelming use of radiolarite – the quartzite percentages are always very low.

Los Canes cave has yielded a long sequence, including Solutrean, Lower Magdalenian, Upper Magdalenian, Early Mesolithic, Late Mesolithic and Neolithic layers (Arias and Pérez 1995). Throughout the sequence quartzite is the dominant raw material in weight, except in the Late Mesolithic phase of the site, dated to the sixth millennium cal BC, where this raw material drops sharply and flint reaches 63.3% (Figure 128.4). It must also be stressed that there is a fairly high variability in the occurrence of the different types of flint.

If we limit our analysis to the retouched items, the scenario undergoes a radical change. Now flint reaches indices of 80% and more (except during the Solutrean). There is also a change of trend between the Upper Palaeolithic on the one side, and the Azilian and Mesolithic on the other. Whereas in the former the Cretaceous flint is the predominant variety, and it tends to increase from the Solutrean to the Upper Magdalenian, in the Holocene the use of Cretaceous flint falls away abruptly, to be substituted by grey, and, to a lesser extent, black flint. The percentage of quartzite tools is always very low, showing an extremely high waste of that raw material.

When we aggregate the types of raw materials, we can see that the evolution of good quality (that is fine-grained, crystalline varieties that break in a regular way) versus bad quality raw materials (quartzite, ‘black flint’, radiolarite) reveals quite a particular history. During the Palaeolithic there is a general trend towards the increase of good quality materials, whereas at the beginning of the Holocene there is an inversion. This seems consistent with the evolution along
the coastal area, or, generally speaking, with the prehistory of south-western Europe. Thus, what is very striking from our point of view is the sharp increase in the use of ‘good’ raw materials in the Late Mesolithic phase of Los Canes. We believe that this must be related to a change in the functionality of the site. Whereas during the Palaeolithic and Early Mesolithic Los Canes seems to have been only a small temporal camp dedicated to the hunting of chamois (Rupicapra rupicapra) and ibex (Capra pyrenaica), the Late Mesolithic occupation corresponds to a funerary use. Those materials come mainly from three graves (see Arias et al., this volume). It seems that a large part of the materials found inside the burials can be interpreted as related to the funerary realm (either as grave goods, or as tools used for some kind of ritual activity). It is, therefore, very likely that particular materials, mainly knapped in the best available kinds of raw material, were selected.

In fact, Los Canes is not so greatly removed from the general trend towards the use of local raw materials during the Mesolithic. At this site there is an increase in the use of exogenous raw materials throughout the Palaeolithic, and an opposite trend during the Holocene. From that viewpoint, the Late Mesolithic phase of this site is not so exceptional. What seems to have happened is that the Mesolithic groups selected, for their grave goods, the best raw materials from among the local rocks. Therefore, the evolution of the ‘good’ versus ‘bad’ raw material ratio means something very different in the Palaeolithic from what it does in the Mesolithic. In the former, the good raw material is mainly an exogenous flint, the Cretaceous variety, coming from at least 40km away. Its high percentage obviously reflects the great mobility of the Palaeolithic groups, and the increase seen from the Solutrean to the Upper Magdalanian is an indicator of the changes in the technology that obliged them to select better quality flint for tools such as burins or backed bladelets. During the Mesolithic and the Neolithic, the groups of the region focused on the local raw materials, probably as a particular case in a general trend towards the reduction of mobility and the intensive exploitation of local resources. Yet in the case of lithic raw materials the ratios changed depending on the functionality. When they needed better quality tools, in this case for symbolic and social reasons, they selected the best locally available rock – grey flint – although it was probably less frequently found than other coarser flints or quartzite.

This seems to be confirmed by the data from the neighbouring cave of Arangas (Arias and Ontañón 1999), probably a base camp during the Mesolithic some 500 years before the time of the burials at Los Canes. In that Mesolithic context quartzite is the predominant raw material, and, amongst the varieties of flint, ‘black flint’ and radiolarite reach higher indices than ‘grey flint’.

However, for Los Canes the raw materials are not distributed at random. As at Los Azules, there is a correspondence between the types of tools and raw materials. Whereas burins are consistently made from good quality (Cretaceous and ‘grey’) flint, local raw materials (especially ‘black flint’) reach fairly high indices amongst the endscrapers and backed bladelets. The geometric microliths show a very interesting feature. 56% are made from bad quality flint (‘black flint’ and radiolarite) or quartz. Yet this does not seem to be the result of opportunistic knapping, as there is a correlation between the type of raw material and the retouch technique (abrupt, Helwan, or mixed retouch). When they are compared with Cramer’s V test, the null hypothesis is confirmed to an acceptable confidence level ($V^2 = 0.545; \alpha = 0.063$). Thus it seems clear that the quality of the rocks, and especially the difficulties involved in developing particular knapping techniques for some of them (either for their quality, or for the size of the nodules), required very careful selection of the raw materials for each type of tool.

Finally, the cave of El Espertín (1200m asl) gives us an insight into high-mountain sites during the Late Mesolithic: it is dated to 7790±120 BP (7030–6440 cal BC; Gif-10053) (Neira 1997). Here local varieties are responsible for 99% of the raw materials, with a strong predominance of black flint, followed by quartzite and radiolarite (Fuertes 2004).  

Conclusions

To summarize the previous discussion, we can state that during the Mesolithic the human groups that lived in the eastern part of Asturias made extensive use of what we can call ‘alternative’ raw materials: the main rock used for knapping activities was quartzite, but they also exploited several local, coarse-grained, bad quality varieties of flint, such as radiolarite or ‘black flint’; they even, occasionally, knapped sandstone and limestone. It appears that the use of local raw materials tended to increase throughout the development of the period, perhaps reflecting a general trend towards the intensive exploitation of resources in limited areas, and perhaps some kind of territoriality (see also Arias et al., this volume).

There is a clear relationship between the typology and the raw material. Some tools (such as picks or denticulates) are consistently made of quartzite; others, such as endscrapers, mainly use bad quality flint, whereas the good quality flint is reserved for microliths and, generally speaking, blade industries. They also developed a knapping technique specifically suited for those materials, such as the NUPC technique for quartzite.

Finally, the variability in the raw materials seems to be mainly related to the activities performed on-site, and also in some cases to social factors, such as the selection of good quality flint and specific tools for funerary structures.

Acknowledgements

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