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Flint as raw material in prehistoric times: Cantabrian Mountain and Western Pyrenees data

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ABSTRACT

Currently, investigations about siliceous resources exploited during prehistoric times in the Cantabrian Mountain and Western Pyrenees are still scarce and, generally, they did not employ methods which go deeply into the provenance characteristics.

A review of the studies of lithic resource exploitation offered by historiography indicates that the theme has been examined in a generalized way in most cases. A model with a clear difference between the Eastern and Western territory of the Cantabrian Coast was created: an area with flint and an area without flint. This model needs to be qualified, because in recent years siliceous outcrops have been discovered in zones of the Western Cantabrian Mountains (Asturias). Information from the investigations in the Cantabrian Mountains, Basque-Cantabrian Basin, and Western Pyrenees indicates diverse patterns. There is a preference for lithic raw material found near the occupations, together with the inclusion of exotic or distant flints, always of good quality, to a greater or lesser extent, according to the chronological periods and the geographical location.

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1. Introduction

Prehistoric knappers employed a great variety of lithic materials as raw material. Aside from having an appropriate size, those materials only needed suitable fracture and hardness in order to achieve their technological purposes.

Therefore, among the lithic raw material used in Prehistory, we can find "hard rocks" that embrace the entire petrogenetic spectrum from igneous and metamorphic to sedimentary. The fundamental ones are the siliceous rocks of non-detrital sedimentary origin (commonly named flint), because of their excellent properties for knapping and the wide distribution of outcrops. There can be no doubt that this was the main mineral resource in Prehistoric times in SW Europe.

Flint is of great interest as a lithic raw material, also considering that is a "Traveller rock". Since the beginning of the prehistoric investigations (mid-XIX century, for example Damour, 1865), the necessity for obtaining information about the provenance and availability of these lithic resources has been recognized. Nevertheless, the difficulty in conducting this type of study has caused the results to be poor. A geoarcheological cross-functional view is necessary to have valid information about mobility and territoriality. In this way, since the late 1990s, lithic provenance studies were undertaken systematically, focused in the Basque-Cantabrian Basin and in the Western Pyrenean region, broadened to the Cantabrian Mountains, Cenozoic Ebro Depression, and southern Aquitaine Basin.

This paper is a compilation of the investigations about flint availability and exploitation in the territory. The siliceous rocks are described and information of the previous management studies is summarised, in order to develop a classification of the flints from the perspective of the diffusion.

2. Overview of siliceous rocks investigation in the Cantabrian Mountains and Western Pyrenees

The flint availability as a raw material in the Western Pyrenees is an investigation that began to develop systematically in the 1980s in the North-Pyrenean watershed. The studies in 1980–85 were started by the team formed by Chauchat and Normand, and produced many publications (Normand, 1986, 1987), initiating analysis in the Grand Sud-Ouest of France. There were also works about flint in adjacent regions with reference to their geological aspects in north-Aquitaine: Séronie-Vivien and Séronie-Vivien (1987), or to

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the prehistoric provenance in Aquitaine: Demars (1982); Geneste (1985, 1988); Geneste and Rigaud (1989); Morala (1984); Turq (1989), and in Midi-Pyrénées: Simonnet (1981). Those studies culminated in the celebration of the Vth International Flint Symposium held in Bordeaux (France) in the autumn of 1987 where several contributions were presented and edited by Séronie-Vivien and Lenoir (1990).

In the North-Pyrenean watershed, investigations continued since the symposium: in Aquitaine (Demars, 1994; Turq, 2000; Séronie-Vivien, 2003); in Midi-Pyrénées (Chalard et al., 1996; Lacombe, 1999; Simonnet, 1999, 2002; Foucher, 2004); in Charante (Fouéré, 1994); in Creuse (Aubry, 1991); in Auvergne (Surmely et al., 1998); in Languedoc (Briois, 1997; Grégoire, 1998; Bazile, 1999); in the South-Alpine Massif (Bressy, 2003); in Pyrénées-Atlantiques and Landes (Normand, 1993, 2002; Bon et al., 1996; Bon, 2002).

In the South Pyrenean watershed of the Western Pyrenees, research followed a different course. The studies about silicifications had begun in a systematic way in the 1980s, exclusively centred on geological aspects (Elorza and Arriortua, 1985; Elorza et al., 1985; Elorza and Bustillo, 1989; Tarriño el al., 1989; Urtiaga et al., 1990). The pioneer attempt of petrographic characterization of flint in a prehistoric site was carried out by Straus and Clark (1986) in La Riera cave (Asturias). It was not until the next decade when works based on the application of geological knowledge and methods started to attempt to identify the prehistoric flint provenance. However the results were not very conclusive, including Arias (1990, 1992) also in Asturias; Sarabia (1990a; 1990b), González Sáinz (1992), Bernaldo de Quirós and Cabrera (1996); Montes-Barquín and Sanguino-González (1994) for Cantabria and Ortiz et al. (1990) and González and Ibáñez (1992) for the southern Basque-Country, Mazo and Cuchí (1992) and Mandado and Tilo (1995) in Aragon, and Terradas et al. (1991), Terradas (1996), and Mangado (2005) in Catalunya.

In the VIth International Flint Symposium held in Madrid and Granada in 1991, the scientific contributions about Cantabrian-Pyrenean flint and adjacent regions were limited and exclusively of geological character: Elorza and García-Garmilla (1997) and Ortí et al. (1997), with the exception of a work presented about the presence of non-local flint in the north-Pyrenean watershed (Aquitaine) (Lenoir et al., 1997). The VIIth and last International Flint Symposium held in Bochum (Germany) in 1999 did not include any scientific contributions about lithic raw materials in the Cantabrian-Western Pyrenean Region. The end of the 1990s saw important works relating to the provenance of flints used in prehistoric times in the southern Pyrenees. In the Eastern area, in Catalunya, the archaeopetrological studies began to emerge with two PhD thesis (Terradas, 1996). The scheme of flint acquisition that existed in the Cantabrian area previously was that of Sarabia (1999a; 1999b), where local or not very distant management of raw material was accepted. New data provided information indicating the mobility of lithic raw material (Tarriño, 2001a), changing the previous acquisition model. In this new model, it is usual to identify transport of lithic remains tens of kilometres away from the site, in some cases exceeding a hundred and exceptionally two thousand kilometres for the Upper Palaeolithic. The information about flints of the Cantabrian Region now can be compared with that obtained for the identified types in the North-Pyrenean watershed.

In 2009, another International Congress in lithic raw materials was held (2nd International Conference of the UISPP Commission on Flint Mining in Pre- and Protohistoric Times). Here were presented for the first time the investigations that have been accomplished about the prehistoric mines of Treviño (Tarriño et al., 2011a, 2011b). Rissetto (2009) presented his PhD thesis about the Magdalenian in Eastern Cantabria. Subsequently, studies of raw material provenance of emblematic sites were carried out, including Las Caldas (Asturias) (Corchón et al., 2007), Altamira (Cantabria), (Tarriño, 2014), Aitzbitarte IV (Gipuzkoa) (Tarriño, 2011a), Santimamiñe (Bizkaia) (Tarriño, 2011b), Isturtiz (Pyrénées-Atlantiques) (Tarriño and Normand, 2002; Elorrieta, in press), and el Sidrón (Asturias) (Santamaría et al., 2011; Tarriño et al., 2013).

Currently, all the active projects of the University of the Basque-Country (UPV/EHU) have included studies for the characterization of flint types as raw material, and several PhD thesis are in progress. In this way, the acquisition patterns and the use and diffusion of this mineral resource for the Cantabrian-Pyrenean Region were investigated.

3. Petrological approach study of lithic raw materials

3.1. Methods

The lithic remains gathered in the archaeological sites are the only vestiges that can provide information about sourcing areas. However, surveys of this type of material (for our region flint, generally) have been very few.

The study of the lithic raw material questions from a petrologic approach offers the possibility of analyzing flint on three levels (Tarriño and Terradas, 2013):

- Textural analysis: allows characterization of the orthochemical (crypto/microcrystalline quartz nature, carbonate relicts, etc.) and allochemical components (fossils, mineral grains, dolomitization, etc.). It is accomplished using microscopy (stereoscopic, petrographic, and scanning electronic microscopes).
- Mineralogical analysis: for the characterization of the siliceous minerals presence (quartz ± moganite ± opal); impurities contents (carbonates ± sulphates ± oxides ± sulphides ± clays) using X-Ray Diffraction (XRD); organic matter and water contents are determined by Raman Spectroscopy, Infrared Spectroscopy and Thermogravimetric Analysis (TGA).
- Geochemical Analysis: allows the characterization of the geochemical fingerprint of flint regarding its majority and minority components using X-Ray Fluorescence (XRF); trace and Rare Earth elements are determined using Inductively Coupled Plasm Spectroscopy (ICP-MS/OES).

3.2. Objectives of the petrological study

By giving the petrological perspective to the investigations, we can contemplate the geological characterization and the geological/archaeological implications related to the diffusion and the management of the prehistoric lithic industries (Tarriño, 2006a).

The main proposed objectives are:

1. Cataloguing the silicifications capable of being employed as raw material;
2. Petrological, mineralogical and geochemical characterization of the geological flints and their host rock, using the techniques described above;
3. Establishing discriminating criteria between different types of flint by carrying out analyses of the lithic remains collected in archaeological sites;
4. Detecting the points of supply (quarries) of such mineral resources and the geological-geomorphological determining factors that have allowed their exploitation (similar to what would be involved in conventional work of mineral sites);
5. Identifying which of the listed flint was used as raw material in the lithic industries of the archaeological sites; and

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