Flint economy in the Pyrenees: A general view of siliceous raw material sources and their use in the Pyrenean Gravettian

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Abstract:

The aim of this article is to present a very general view of siliceous raw material sources in the central Pyrenees, with support from recent bibliographic references. To illustrate the use of these materials in the Upper Paleolithic, we chose the example of the Gravettian occupation of Gargas Cave (Hautes-Pyrénées, France). Finally, we describe a few economic characteristics of the Pyrenean region, which are distinct from the Perigordian context in several ways.

Keywords: Gravettian; flint economy; Pyrenees; raw material sources; Lepidorbitoide flints; lithic industries

1. Introduction

Our knowledge of flint procurement sources in the Pyrenean context has become increasingly precise over the last twenty years, drawing on the work of pioneers such as Louis Méroc (1947; 1953) and Robert Simonnet (1981; 2003). (For the early historiography on this topic, see S. Lacombe's doctoral thesis (1998).) In the 1990's, research was conducted in the framework of the collaborative program entitled *Lithothèque régionale*, directed by P. Chalard (1994-1996) and then F. Briois (1997-1999), but this work remains largely unpublished (Briois et al. 1997; Briois 2000). The doctoral thesis of S. Lacombe (1998) on the Late Glacial lithic industries of the Pyrenees presents an updated synthesis of both the siliceous material resources and their use in the Magdalenian and Azilian periods. The most recent articles by R. Rimonnet (1999; 2003) present a synthesis of his work and complement his *lithothèque* (raw material reference collection) constituted through field surveys conducted over nearly 50 years. This reference collection is kept at the TRACES laboratory (UMR 5608 of the University of Toulouse Jean Jaurès). For interested readers, we provide most of R. Simonnet's scientific works on the characterization of Pyrenean siliceous raw materials. These include: his general synthesis articles (recent and earlier: 1981, 1996, 1999a, 1999b, 2002, 2003), in which there are paradoxically very few petrographic or geological analyses, as well as a micro-paleontological description by J. Villatte "that could serve as an inventory of

Journal of Lithic Studies (2015) vol. 2, nr. 1, p. 111-129 doi:10.2218/jls.v2i1.1306

Published by the School of History, Classics and Archaeology, University of Edinburgh
ISSN: 2055-0472. URL: http://journals.ed.ac.uk/lithicstudies/

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the bioclasts of Danian flint"); and his earlier articles on more general subjects (1967, 1969, 1973, 1976, 1982, 1985) or thematic topics (e.g. Paleolithic portable art: 1990), in which there are a few analyses of flint, or studies inserted within monographs (Mauran, La Vache: 1994, 2003). Recent research has drawn largely on petro-archaeological and geological analyses, such as that of lepidorbitoide flints (Séronie-Vivien & Foucher 2006; Séronie-Vivien et *al.* 2012). (There are also a few university theses, at the Master's level, for example, Solène Caux, Guilhem Constans, Théo Minet.) The efficacy of these analyses has been demonstrated and they have revealed the complexity of Pyrenean lithic resources. Finally, the collaborative project led by P. Fernandes, contributing to the preceding research questions on a trans-regional scale, should provide a cartographic and archeo-petrographic database that will be very useful to prehistorians and provide an opportunity to remobilize research in the Pyrenees (Fernandes et al. 2013).

2. Flint from the Petites Pyrénées and Plantaurel (central Pyrenees)

The Petites Pyrénées and Plantaurel (their eastern extension) are one of the largest sources in terms of their geographic extension (Figure 1). They have furnished very diverse flint types (Danian, Paillon, Montsaunès, Foix-Berdoulet of Urgonian in the Foix basin, "black of Couterets", "brecciated flint of Pellegrin-Jean Nègre", "flint with charophytes": cf. Simonnet 1981; 2003).

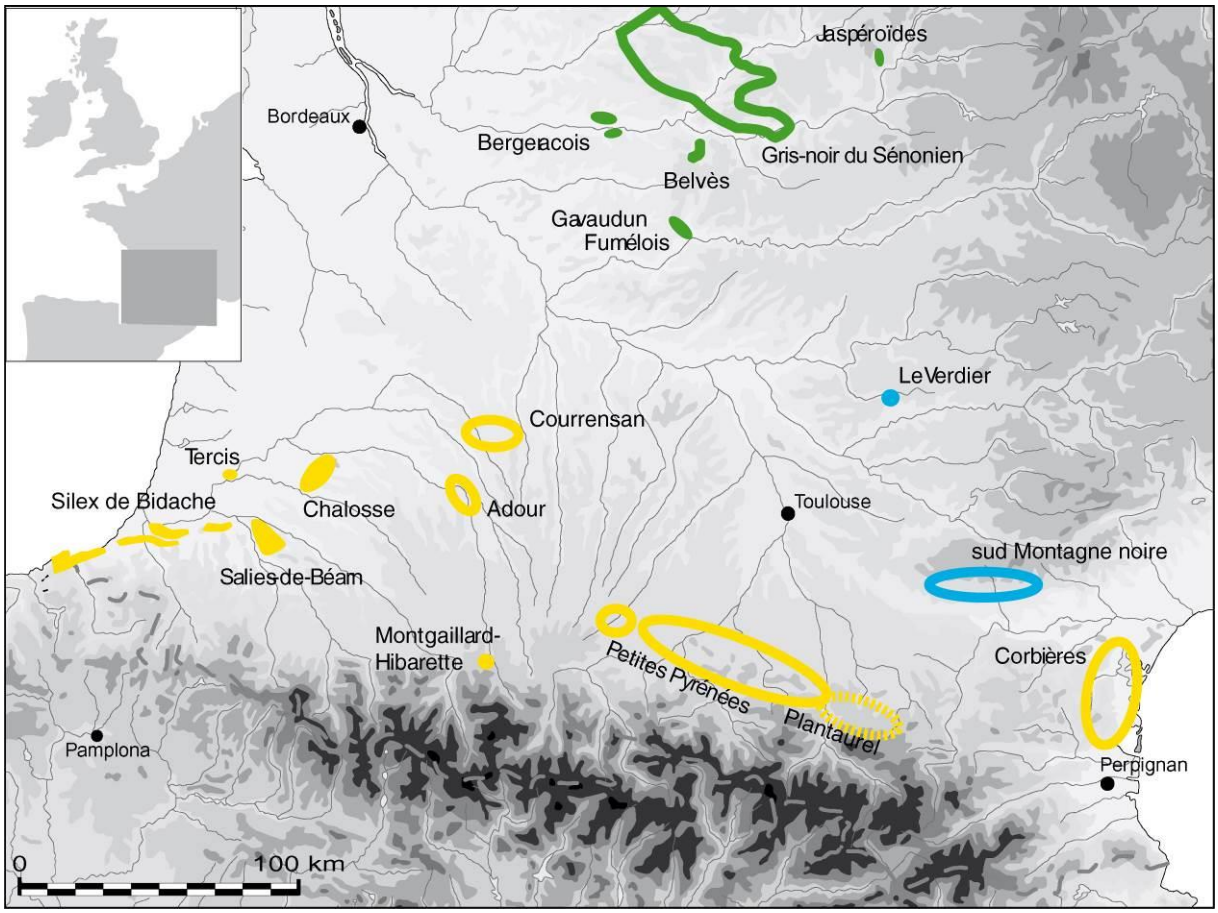


Figure 1. Map of flint sources in the Pyrenees. (From R. Simonnet, Ch. Normand, M. et M.-R. Séronie-Vivien, F. Bon, A. Tarriño, A. Morala, A. Turq, P.-Y. Demars, F. Briois, S. Grégoire).

– **"Blue" flint**, originating from the Danian formations is "a smoky, and especially blueish, translucent flint used throughout time and known by the local populations by this

name. Prehistorians called it "*chalcedonious*". Its appearance is similar to the so-called "Tertiary" flints of other regions" (Simonnet 1999b). It is a very ubiquitous and found throughout the Petites Pyrénées and Plantaurel chains. S. Lacombe (1998) distinguished, as did R. Simonnet for a time, the "Blue" and "Smoky" types based on colorimetric and morphological data, the latter having much smaller useable volumes and traversed by numerous tectonic fractures.

– The Danian formations of the Petites Pyrénées and Plantaurel formations furnished other flint types similar to the "Blue", but with other features. We can cite the types designated by R. Simonnet as: "Mixed", "Saint-Michel", "Dôme d'Aurignac", etc.

- A specific flint a "blond" flint type, originating from the Danian formations of the Dôme d'Aurignac, was identified and found flaked in the Aurignacian of Tuto de Camalhot (Bon, Simonnet, Vézian 2005). It is a "very good material in the Pre-Pyrenees context. It is found in the form of regular blocks with a diameter greater than 10 cm and is fine-grained with a homogeneous texture".

– **Paillon flint**, originating from Maastrichtian formations (Saint-Martory, Haute-Garonne), was described in the late 19th century (Leymerie 1881). Though it is a very characteristic and easily identifiable flint, no detailed petrographic analysis of it has yet been realized.

– **Foix-Berdoulet flint**, originating from the Urgonian formations of the Foix region. Other flints have been observed in the Lias and Albian-Aptian formations (according to Simonnet).

– **Montsaunès-Ausseing flint** originates from Maastrichtian formations. It is characterized by a high density of foraminifera and orbitoids (according to R. Simonnet). We find it localized in the southern part of the Boussens water gap (Montsaunès, Ausseing Mountain: see Figure 2). We presented a precise analysis of it when the **Tarté flint** was found and defined (Séronie & Foucher 2006). This latter, which contains many lepidorbitoides was defined based on the archaeological assemblage recovered during the early excavations at Tarté (Aurignacian and Gravettian archaeological site). Its intrinsic characteristics (structure similar to that of the Montsaunès-Ausseing flint and cortex type) and the large quantity of it flaked at the site, suggest that the procurement sources must be nearby, probably in the Boussens water gap zone, which is highly adapted to their formation (in terms of the geomorphological context). Meanwhile, we have not yet found these sources.

3. The other Pyrenean sources

3.1. Pyrenean Flysch flint

The outcrops of Pyrenean Flysch flint also yielded an abundant and high quality siliceous material in the Montgaillard-Hibarette region (Barragué et al. 2001), as well as in the Bidache and Iholdy regions further west in the western Pyrenean zone (Tarriño 2007 and C. Normand archaeology field survey).

– **the Montgaillard-Hibarette type**. This name covers many aspects. Hibarette corresponds to the Paleolithic flaking workshops located at secondary procurement sources (Poudingues de Palassou), constituted in part by the dismantling of the Flysch limestones (Upper Cretaceaous); these latter outcrops are located at Montgaillard where flint nodules are found in their primary position (Barragué et al. 2001).

– **Orignac flint** was defined by S. Lacombe (1998) in the outcrops (Turonian to Santonian) located at the Adour Valley outlet. This flint is similar to that of Montgaillard-Hibarette but smaller in size (centimetric slabs).

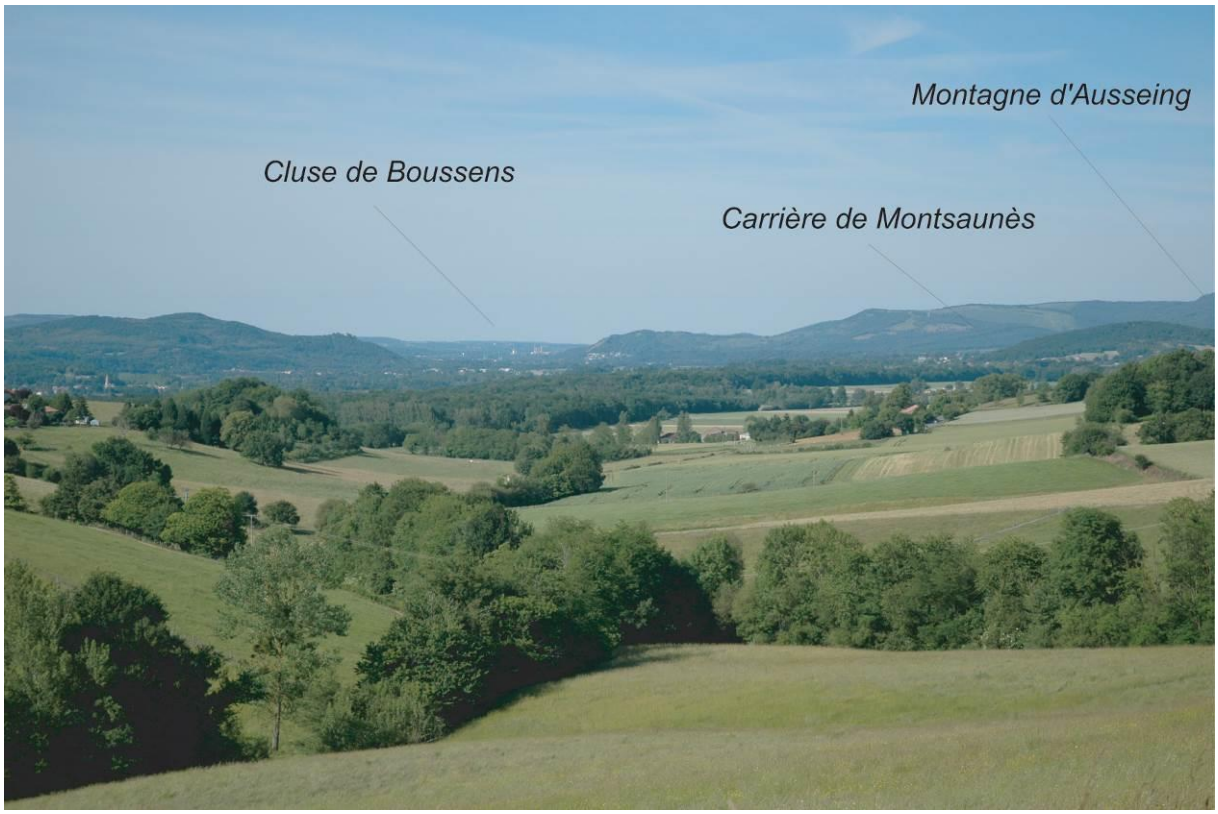


Figure 2. View from the S-W of the Boussens Pass.

3.2. Courensan flints

This flint type, very similar to the Pyrenean "Blue" type, is located in the Gers department in the commune of Courrensan (Simonnet 1996). This zone was also surveyed by G. Duclos (1991), who discovered numerous Paleolithic surface sites.

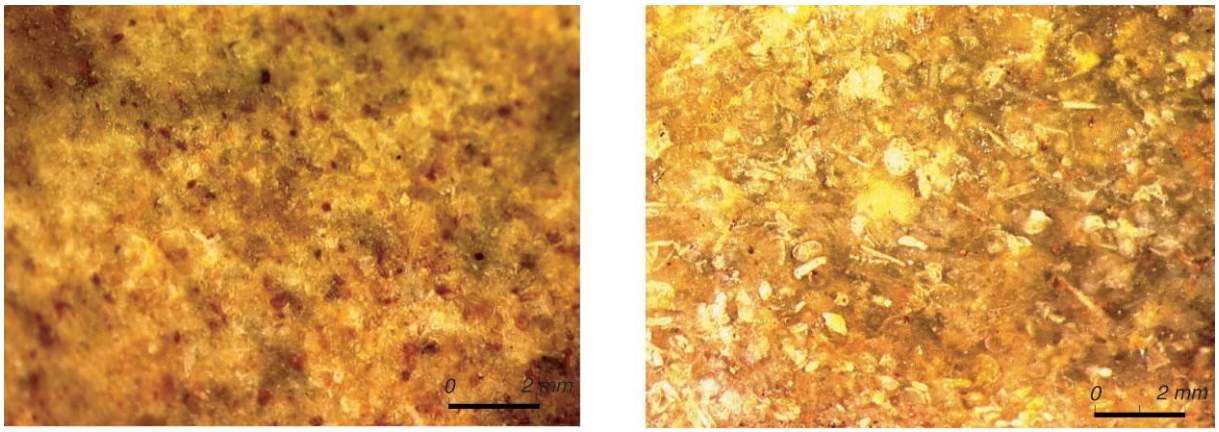
3.3. The sandstone sources of Armagnac

Though it is found in the northern part of the Gers department, beyond the Pyrenean foothills zone, we can mention the siliceous sandstone of Cazalège (Castelnau d'Auzan). This is a very tough raw material, well adapted to flaking, that was mainly used during the Acheulean (Millet et al. 1999).

3.4. Lepidorbitoide flints

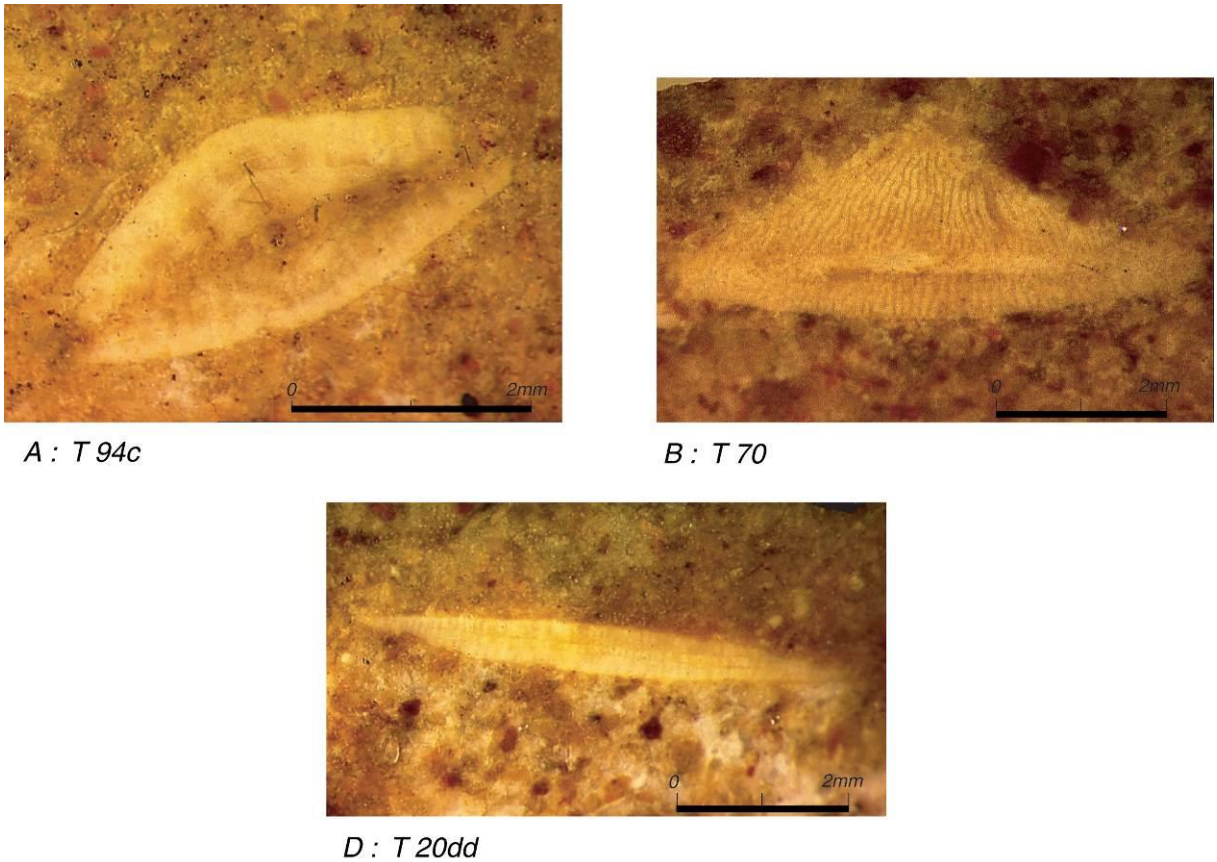
The important discoveries made in recent years most specifically concern one raw material type: Lepidorbitoides flints (Figures 3 to 5). This is a typical Pyrenean flint that does not exist in the Dordogne region. It was defined based on the work of Ch. Normand (1986), M. Séronie-Vivien (1994), and F. Bon et al. (1996). We formerly thought that this flint existed only in Chalosse, but it has also been identified in the Petites Pyrénées, in the Boussens water gap (Séronie-Vivien & Foucher 2006), and other sources were recently discovered in the northern part of the Gers department (Colonge et al. 2011), as well as further south in the Adour basin (Séronie-Vivien et al. 2012).

These new data completely change the direction or orientation of the circulation of this material type and underline that the Pyrenean resource site context is not as simple as we thought just fifteen years ago. Now the discovery of a tool in Lepidorbitoide flint does not forcibly indicate that it came from Chalosse.



A : T 20e B : M 305

Figure 3. Textural types of the Tarté and Montsaunès flints. A) Tarté type: wackestone texture with rounded intraclasts, often brownish, and lignitic fragments). B) Montsaunès type: packstone texture with rounded intraclasts and many bioclasts (ostrocods and small forams).



A : T 94c B : T 70

D : T 20dd

Figure 4. Orbitoïdinés. A) Orbitoides media (Tarté T94c). B) Clypeorbis mamillata (Tarté T70). D) Lepidorbitoides socialis (Tarté T20dd).

4. Flints from the western and eastern Pyrenees

In Chalosse, the Audignon-Montaut anticline and the Bastennes-Gaujac diapir are zones that are very rich in flint sites (alterites) and Paleolithic flaking workshops. Other more sparse sources are found at Tercis and Salies-du-Béarn (Tarriño 2007 and C. Normand archaeology field survey).

In the western part of the Pyrenees, large sources were discovered and described in the Corbières and to the south of the Black Mountain (Briois 2005; Grégoire & Bazile 2019; Grégoire *et al.* 2010).

We should also note that the large fluvial systems transported significant quantities of stone materials (flint and quartzites) and they were collected from the areas in which they were accessible during Prehistory, such as the Adour (all along its course from its exit from the foothills at Montgaillard) and the Garonne (in the Boussens water bank, at least until its confluence with the Tarn).

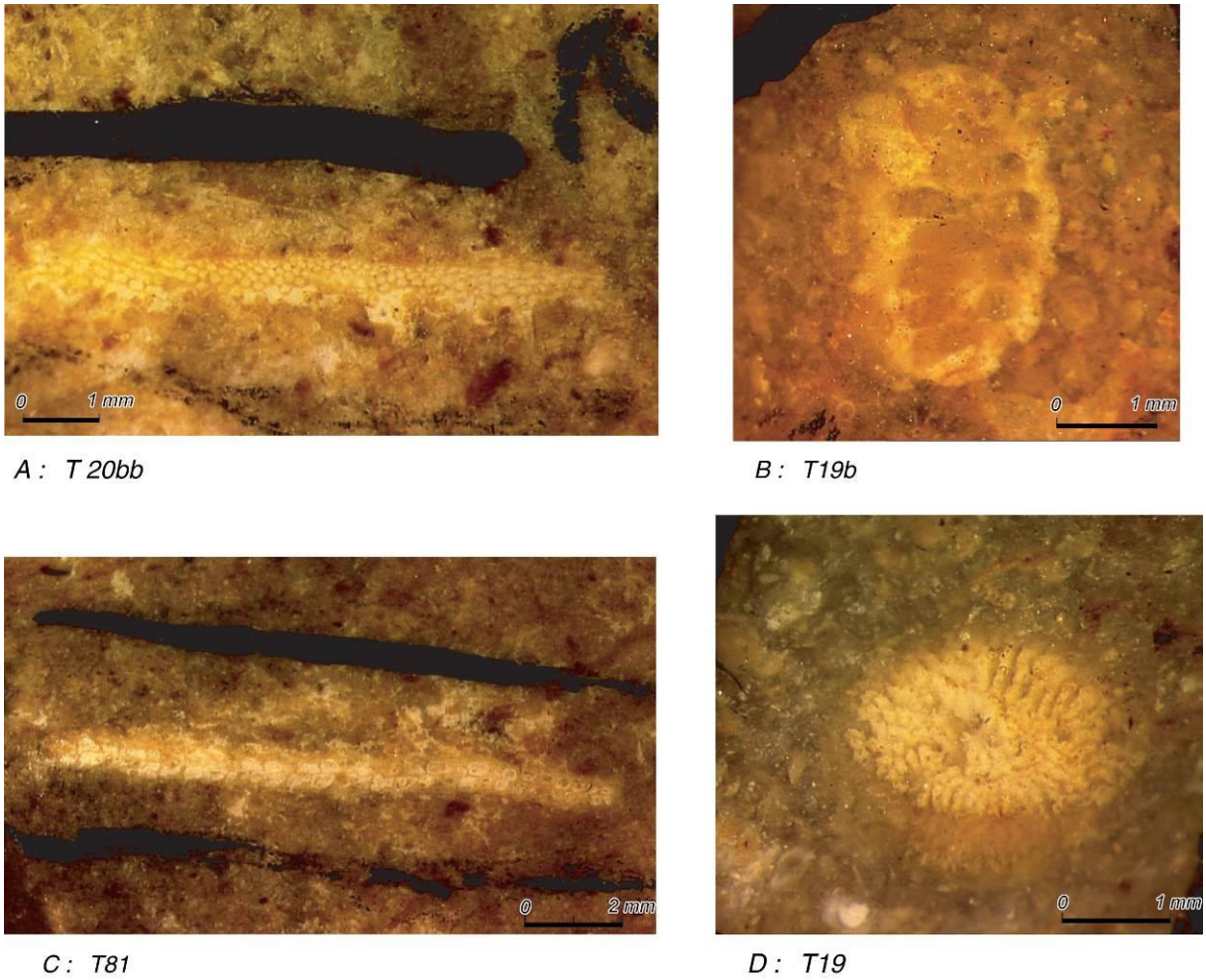


Figure 5. Algues: A) cf. Polygonella (possibly solénoporacée) Tarté T20bb. B) Neomerys (dasycladacée) Tarté T19b. C) Munieria (dasycladacée) Tarté T81. D) Neomerys (dasycladacée) Tarté T19.

5. Flint beyond the Pyrenees

These flints, qualified as allochthonous, are frequently found in Pyrenean sites throughout the Upper Paleolithic: Aurignacian, Gravettian, Solutrean and Magdalenian (Lacombe 1998; 2014; Bon 2002; Foucher 2004**).** They are very diverse and come mainly from the Quercy and Perigord regions: Verdier, Gavaudun, Fumelois, Belves, Gray-black Senonian from the Perigord region, Bergeracois, Jasperoids from the periphery of the Massif Central, or even the upper-basin of the Èbre (Tarriño 2006). The main studies of raw materials in the Perigord region are Séronie-Vivien & Séronie-Vivien (1987), Morala & Turq (1990), Demars (1994; 1998), Turq (2000). An analysis of Verdier flint is currently in progress (personal communications with Christian Servelle).

6. Flint economy in the Pyrenean Gravettian

6.1. Gargas Cave (Hautes-Pyrénées, France): a few reminders

Gargas Cave is one of the reference sites for the European Gravettian due to its exceptional parietal art and its rich archaeological deposits. The latter were excavated from the end of the 19th to the early 20th centuries.

The most extensive excavations were realized by F. Régnault as early as 1873, followed by É. Cartailhac and H. Breuil in 1911 and 1913, but the work of these latter researchers was not published until forty-five years later, based on their field notes and a synthetic typological study of the industries discovered (Breuil & Cheynier 1958).

During the 20th century, research in Gargas Cave was mainly focused on the parietal art (Foucher et al. 2007). The first painted handprints were discovered in 1906 by F. Régnault (1907, 1910) and a complete study of the hands and engraved panels was undertaken during the following years by H. Breuil and É. Cartailhac, in collaboration with H. Obermaier (Cartailhac 1907; 1909; Cartailhac & Breuil 1910; Breuil 1952; 1958). In 1976, C. Barrière published a very complete monograph on the parietal art and the engravings in particular, following an attempted synthesis by M. Cantet and A. Clot in 1974. Continuing the work of A. Sahly on the hands (1966), and that of A. Leroi-Gourhan (1967), in 1987 M. Groenen published a critical analysis with the first reasoned and completed inventory on this theme, until then treated in a very partial manner (Groenen 1987; 1988). A ^{14}C date of 26 860 BP ± 460, realized on a bone wedged into a fissure of the Great Hand Panel, established an indirect Gravettian framework for the parietal art (Clottes et al. 1992).

Since 2004, we have conducted a research program on this cave (Foucher et al. 2008; 2011; 2012; San Juan & Foucher 2010). Our main aim is to obtain a detailed stratigraphic sequence of the site in order to define the succession of its occupations more precisely than was achieved by the synthetic scheme produced by the early excavators. It also provides an opportunity to conduct a paleo-environmental study of the site, which has never been done before. Since the stratigraphic sequence is thought to cover a broad chronological period (Mousterian, Chatelperronian, Aurignacian and Gravettian), this study will be the first of its kind in the Pyrenees.

This new field research also takes a broader, more global approach to the site, including a revision of the early Cartailhac-Breuil collections and an integration of both its decorated cave and habitation site aspects, with the goal of obtaining a better understanding of the functional, spatial and chronological features of its occupation by the authors of the parietal art. Through this research, we hope to integrate an ensemble of reliable chrono-cultural elements that will enable us to better situate the occupations and art of Gargas within the regional and European contexts.

6.2. The Pyrenean Gravettian lithic industries: typo-technological data

The data on the lithic industries of Gargas Cave are part of the more general data set associated with the Pyrenean Gravettian. We have already presented a first synthesis that included the results obtained from a revision of the early Cartailhac-Breuil collections (Foucher 2004). The data collected through the new excavations with contribute more precise information, but will probably not change the general scheme defined some fifteen years ago.

The main elements of the synthesis that we presented at the colloquium in Les Eyzies (France) remain current (Foucher *et al.* 2008a). What we observe is a high degree of homogeneity in the Gravettian lithic industries of the Atlantic and central Pyrenees, characterized by:

– Noailles burins (dominant),

– backed pieces (Gravette and Vachons points, and micrograveттes),
– scaled pieces (*pièces esquillées*).

These three typological groups dominate in the lithic assemblages of all the Pyrenean sites (Foucher 2004). They are followed by backed blades and bladelets, bladelets with marginal retouch, truncations on blades or bladelets, and then endscrapers, truncated and dihedral burins. We also observe that the tools are very small (microlithism), as much among the Noailles burins as the Gravette points (micrograveттes), and the bladelets with marginal retouch (Figure 6).

The absence of Font-Robert points is another characteristic typological feature of these assemblages: they paradoxically appear much further west at the sites of Irikaitz (País Vasco), Cueva Morín (Cantabria) and La Viña (Asturias), as well as in the Pyrenean hinterland to the north at the Les Battuts rock shelter (Tarn), even if their presence there is almost anecdotal. The recent discovery of an open-air site near Bayonne (Le Prissé) that yielded one Font-Robert point (personal communication Marina Redondo) barely modifies the general context. We must await the publication of this site, as well as that of Viña (and revise the data from Cueva Morín), and then reevaluate the possible relationships with Irikaitz in order to understand the significance of this typological component that seems to be more localized on the Cantabrian Cornice.

Minor statistical variations exist between the sites, but they do not seem to indicate a chronological evolution (Foucher 2004); they could as well be due to factors other than cultural ones (frequent biases in statistical calculations due to selective sorting by some early excavators), or functional variability ("specialized" sites). In any event, the lithic assemblages from sites excavated long ago (Isturitz, Gargas, Tarté), and others more recently (Enlène), show great similarities in both the general composition of their tool assemblages and in the forms and manufacturing techniques of some pieces (Gravette points, Noailles burns, scaled pieces). This is even more evident if we consider the variables forcibly introduced by the heterogeneity of the occupations and the possible functional differences of the sites.

The new data concern the chrono-cultural attribution of the shouldered points at Brassempouy. The context of their discovery by E. Piette being too vague, later attempts to attribute them hesitated between the Gravettian and Solutrean (Delporte 1968; Foucher 2004: 139-143). The discovery of new points in stratigraphic position during the excavations by H. Delporte (sector GG2) permitted their attribution to the Gravettian (Goutas & Simonet 2009). In addition, in his work at Isturitz, Aurélien Simonet defined a particular point type with an angled back, present only at the top of the Gravettian sequence (Simonet 2009).

From a technological point of view, the techniques for manufacturing blades and bladelets were relatively simple (both unidirectional and bidirectional laminar flaking, continuity from blade to bladelet detachment). A systematic analysis of the butts of the blanks detached indicates the use of soft stone hammer percussion (a large proportion of highly abraded, or even polished, butts). There was also an autonomous production of flakes and elongated flakes (Isturitz, Enlène, Gargas). There seems to have been little selection of raw materials according to the tool types to be manufactured (Foucher 2004; Simonet 2009). We can note just the one counter example of the shouldered points at Brassempouy, made exclusively from Chalosse flint (Goutas & Simonet 2009). The quality of the siliceous materials from the Pyrenees nonetheless had an influence on the size of the laminar blanks. Due to the dimensions of the nodules available in the central Pyrenean sites, in this zone (Gargas, Enlène), only small blades and bladelets could be manufactured; to find productions of larger blanks, one must move closer to the Chalosse and Flysch flint sources (Isturitz, Brassempouy, Tercis).

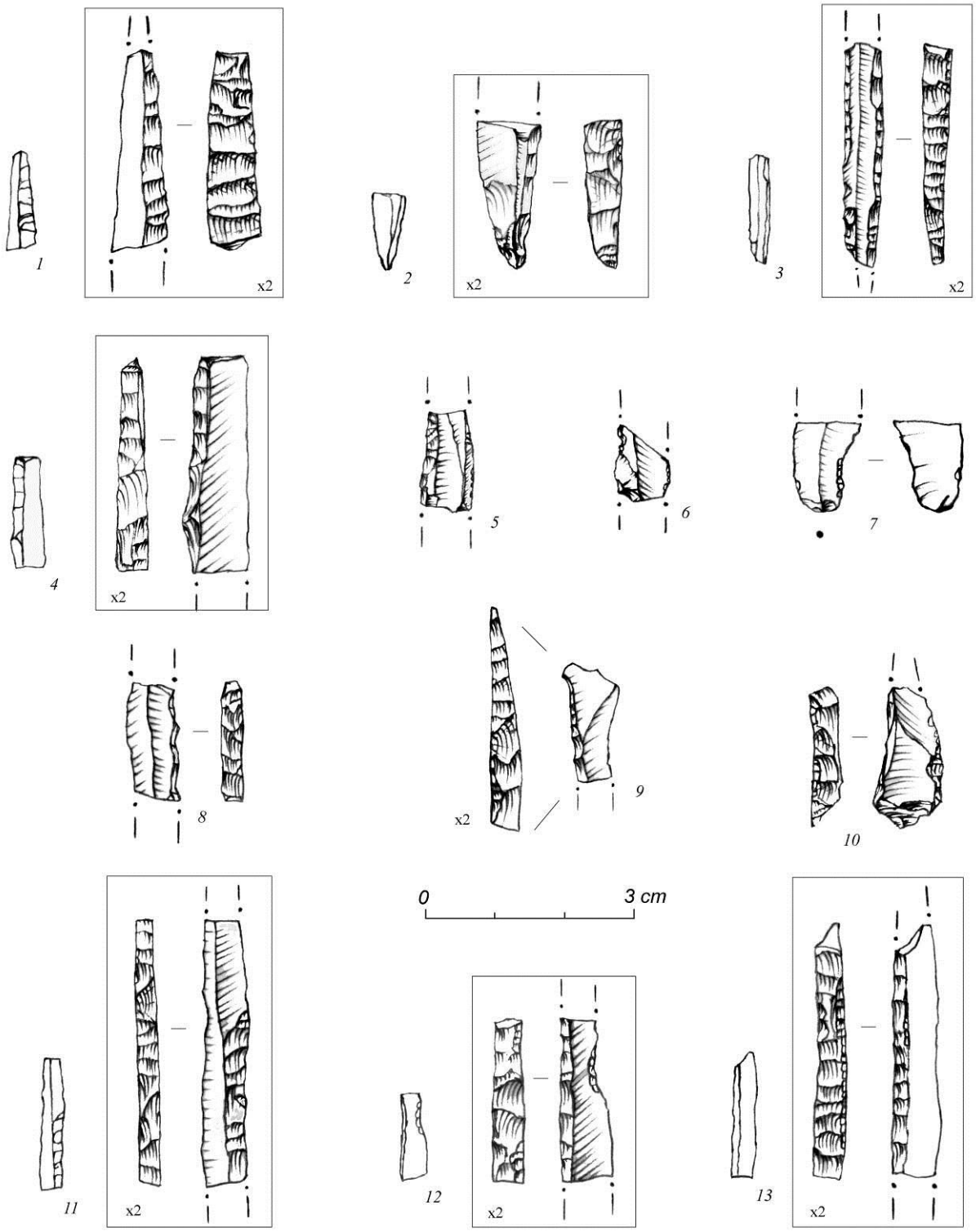


Figure 6. Microgravettes and micro backed bladelets of Gargas Gravettian.

In any event, it is not yet possible to refine the chrono-cultural framework or to imagine the existence of "sub-facies" based on technological data alone (Simonet 2009).

It is also worth noting that in the central and western Pyrenees, we do not find the other industrial entities or technical procedures defined in the Perigord, such as Flechettes, Font-Robert points, the procedures associated with Raysse burins, etc., considered as markers of chrono-cultural trends in the Gravettian.

6.3. The Pyrenean radio-chronological framework

For information on the Pyrenean radio-chronological framework, we recommend several articles (Foucher et al. 2011; Foucher 2013).

For the Gravettian occupations at Gargas, the results suggest long term occupations of the cave (3000 years), with a period of more intense occupation from 27,000 – 25,000 BP. From a chrono-cultural point of view, we observe an early phase with Noailles burins, during the 28,000 – 27,000 BP interval and a middle phase with an identical facies, between 27,000 and 25,000 BP.

6.4. Siliceous raw material circulation: economic data

The map of Figure 7 illustrates the preliminary results obtained at Gargas on the siliceous raw materials used in the lithic industry. The percentages mentioned are calculated based on the tool assemblage.

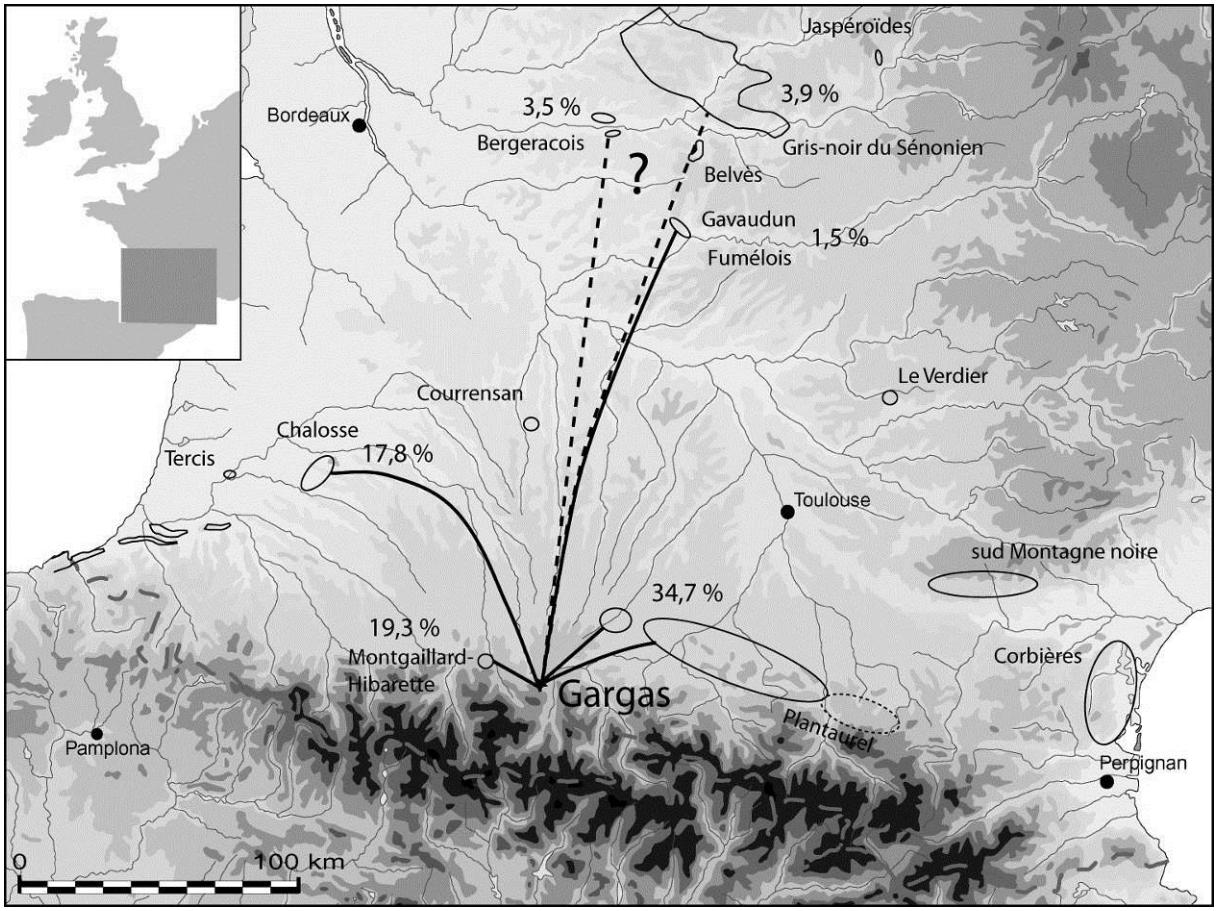


Figure 7. Map of siliceous raw materials used in the lithic industry at Gargas Gravettian (Cartailhac-Breuil collections).

The flint of the Petites Pyrénées is dominant (34.7%), followed by Flysch flint (including Hibarette: 19.3%) and lepidorbitoides (17.8%). Gargas is thus unusual in that it is a Pyrenean occupation site located relatively far from the local raw material sources (20-40 km); the closest ones are 24 km to the north (Lespugue-Montmaurin- Blajan sources) and the Flysch-Hibarette sources 42 km to the west-north-west. We should note the high proportion of flint with lepidorbitoides (17.8%) whose precise provenience remains to be determined (Chalosse or Adour-Gélise basin or Cluse de Boussens). There are several flint types (7.4%) whose origin in the Perigord region remains to be verified. On the other hand, Fumelois and

Gavaudun flint is clearly present (1.5%). These latter could appear anecdotal, but are significant in the orientation of the north-south movements of Gravettian people. Finally, there is one allochthonous flint that could come from the Èbre valley basin (personal communication A. Tarriño).

Given our current knowledge of the raw materials used by Gravettian people, we can reasonably assume that flint procurement was not very difficult in the Pyrenees. Though there are gaps in the distribution of siliceous resources (Figure 1), those available cover the entire Pyrenean zone and could provide prehistoric peoples with abundant and high quality materials.

This specific context nonetheless implies that the Gravettians developed different procurement strategies depending on where they were, including actions to anticipate their future needs. On one hand, we can distinguish an economy of abundance in proximity to the large Chalosse and Flysch flint sources, and on the other, a more rational economy in the Petites Pyrénées zone, where raw materials were more scarce and more heterogeneous in quality This local economy is accompanied by the procurement of more long distance flints (example of Gargas: Figure 7).

A few broad socio-economic traits can be deduced from all of these data:

- constant contacts and exchanges among Gravettian groups in the Pyrenees, in a geographic zone covering at least the Greater-South-West of France; it is possible that this was facilitated by certain very mobile individuals specialized in the prospection of siliceous materials;

- two large north-south and west-east circulation axes in the Atlantic river basin, probably periodically followed in both directions. We also observe these movement directions in other materials, such as shells (San Juan-Foucher, Foucher 2010; San Juan-Foucher 2011; 2013).

Acknowledgment

Thanks to Magen O'Farrell for the English translation.

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