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## Research Article

Elsa Defranould\*

# The Cardial–Epicardial Early Neolithic of Lower Rhône Valley (South-Eastern France): A Lithic Perspective

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**Abstract:** In the lower Rhône Valley, many sites are attributed to the Early Neolithic and dated between 5600 and 4800 cal. BC. According to their ceramic production, they are associated with two cultural facies: the Cardial and the Epicardial. The relation between these two entities is still under debate (chronological, cultural or functional distinctions?). However, little is known about the lithic production of the region since the chipped stone industries are rarely evoked in the socioeconomic and cultural understanding of these first agropastoral societies. The objective of this paper is to propose a regional synthesis regarding Early Neolithic lithic industries, based on typo-technological studies of several assemblages in the Rhône Valley: The Montclus rockshelter (layers 5 to 2), the Baume de Ronze rockshelter, Le Tai and the Aigle cave. These sites are considered to be the key sites for understanding the Cardial/Epicardial complex in this area, but their lithic assemblages have never been thoroughly studied. Special attention will be given to the factors of variability or, on the contrary, to the permanence in the “*schema opératoire*” and we will propose explanations related to geological, functional, chronological and cultural constraints. We will also focus on lithic blade production made from honey flint and the specialisation of “*chaîne opératoire*” which could highlight circulation of this raw material and specialised distribution network. Finally, this synthesis is based on a renewed corpus of radiocarbon dates in order to understand this evolutionary dynamic as finely as possible.

**Keywords:** Neolithisation, lithic industry, southern France, cardial, epicardial

## 1 Introduction: The Cardial and Epicardial

The first manifestations of the Neolithic in the Southern part of France can be divided into two distinct cultural entities: the Impressa and the Cardial sphere (in the broadest sense of the term: Cardial, Epicardial and their epigones). The Impressa, located sporadically along the Mediterranean coast, is attributed to small agropastoral groups from Italy and developed between 5800 and 5600 cal. BCE (Binder et al., 2017a; Manen et al., 2019). The Cardial in the broad sense, i.e. Cardial and Epicardial, which is the focus of this study, shows a significantly increased territorial hold and corresponds to a phase of expansion of Neolithic lifestyles that gradually affected the whole territory of the South of France. The question of its origin is still debated, but this cultural entity developed, a priori, a few centuries after the Impressa, between 5500/5400 and 4800 BCE (Manen et al., 2018; Perrin, Manen, Valdeyron, & Guilaine, 2018).

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The Cardial complex can be divided into two facies, defined on the basis of pottery styles: the Cardial and the Epicardial. Historically, the interpretation and the link between these two facies have been interpreted in different ways. In the 1950s, M. Escalon de Fonton, who excavated the two stratified deposits of Font-des-Pigeons (Châteauneuf-les-Martigues, Bouches-du-Rhône) and Baume de Montclus (Montclus, Gard), defined these two entities on the basis of pottery decoration and viewed them from a monophyletic chronological perspective, the Epicardial following the Cardial (Escalon de Fonton, 1956, 1967). Later, J. Guilaine's work in Languedoc, and in particular, the excavation of Gazel Cave (Sallèles-Cabardès, Aude; Guilaine, 1986), led him to interpret these two facies from a cultural point of view, with each facies corresponding to a distinct group. For him, the Epicardial was "*a completely original stage marked by a very special personality*" (translate from Guilaine et al., 1993, p. 462). In the 2000s, the work of Manen (2000) postulated that these two pottery styles stem from the same non-linear evolutionary phylum, therefore from the same background. Conversely, S. Van Willigen hypothesised that the Epicardial developed preferentially in the hinterland and was the result of interactions between Mesolithic hunter-gatherer groups and Neolithic agropastoral societies (Van Willigen, 1999, 2004).

Subsequently, excavations of important Epicardial settlement sites in the lower Rhône valley, at Taï (Remoullins, Gard; Manen, in press) and in the plain of Nîmes, at Mas de Vignoles X, Mas Neuf and Roussillon (Nîmes, Gard; Perrin, Manen, & Séjalon, 2014) show that Epicardial pottery was clearly produced by fully Neolithic societies. Today, at least partial contemporaneity between Cardial and Epicardial facies is widely accepted on a radiocarbon scale (Binder, 1995; Manen & Sabatier, 2003; Van Willigen, 1999). From a geographic point of view, there is also no clear spatial exclusion between these two entities, even if the Epicardial is preferentially found west of the Rhône. For both entities, there are sites on the Mediterranean coast, in the hinterland, sometimes with successive occupations of the Cardial and the Epicardial on the same site, for example, at Gazel (Sallèles-Gabardès, Aude), Baume d'Oullins (le Garn, Gard) or Baume de Montclus (Gard).

As far as pottery data is concerned, it is now accepted that Cardial and Epicardial productions show common characteristics, with the same clay provisioning strategies, similar morpho-functional categories and decorative structures. However, there are also major technical and stylistic differences between these two facies, especially with regard to tempers, with the use of chamotte in the Cardial and crushed calcite in the Epicardial. Decorative techniques also form an important point of divergence between the two productions: impressions of Cardium shells and the use of incisions to create fluted decorations (Manen, Sénépart, & Binder, 2010).

Subsistence economy data indicate varied and mobile systems of resource exploitation. For meat resources, we observe mainly goat herd exploitation, and more marginally, the consumption of oxen and pigs. And, depending on the site, hunting may continue to play an important role in the food supply (Vigne, 2007). Carpological studies clearly attest to cereal cultivation, sometimes alongside the gathering of wild fruit (Bouby, Durand, Rousselet, & Manen, 2019). Different agricultural practices may have emerged between the Cardial and Epicardial, with the exploitation of wheat/durum wheat, naked wheat and naked polystic barley for the former. On the other hand, hulled wheat, einkorn and emmer wheat are rarer in the Cardial and seem to develop more in the Epicardial (Marinval, 2007, p. 216).

Thus, the question of the nature of the relationship between these two entities is still debated today. Interpretations oscillate between phyletic evolution and/or cultural and functional distinctions. However, these questions have often been considered solely on the basis of pottery records. The aim of this study is to test the variability of another technical sub-system: lithic production. Indeed, studies dealing with these productions are rarer (Binder, 1987; Briois, 2005; Perrin, 2014) and are not often addressed through the lens of the Cardial/Epicardial dichotomy. In this perspective, we wish to question here the variability of lithic productions and to compare the results with other elements of material culture, in particular pottery, in order to reach a better understanding of these historical processes.

## 2 The Choice of the Lower Rhône Valley as a Study Area

The Lower Rhône region, and particularly the current departments of the Gard, Ardèche, Vaucluse and Bouches-du-Rhône, is an ideal area for discussing these issues. This territory corresponds on the one hand to a Neolithic route of entry towards inland regions, but also offers contrasting landscapes (valleys, alluvial plains, limestone

plateaus and deep gorges) favourable to a variety of human settlements. It is also a region that has been explored for a long time and comprises stratigraphic references for the Early Mediterranean Neolithic, as well as a wide diversity of types of settlement, in the open air, caves or shelters. It is still a restricted area where Cardial and Epicardial occupations are found alongside each other. To a large extent, the sites studied here have been characterised from the point of view of pottery production (see in particular the synthesis published by Manen, et al., 2010). Likewise, the selected sites benefit from a large number of reliable dates, which allows for an as refined chronological calibration as possible with current radiocarbon resolution.

The corpus selected here (Table 1 and Figure 1) consists of sites directly studied in my thesis (Defranould, 2019): the Baume de Montclus (Montclus, Gard; e.g., Escalon de Fonton, 1969, 1970), the Baume de Ronze (Ornac-l'Aven, Ardèche; e.g., Beeching, 1987; Thirault & Beeching, 2009), Tai (Remoulins, Gard; Manen, in press) and Aigle Cave (Méjannes-le-Clap, Gard; Manen et al., 2018; Roudil, Roudil, & Soulier, 1979). To these assemblages can be added comparison sites for which published data on lithic industries and the chronometric framework are available: la Font-des-Pigeons (Châteauneuf-lès-Martigues, Bouches du Rhône; Binder, 1987; Binder, Battentier, Delhon, & Sénépart, 2017b), Le Mas de Vignoles X (Nîmes, Gard; Perrin et al., 2014), la Roussillonne (Nîmes, Gard; Perrin et al., 2014), le Mas Neuf (Nîmes, Gard; Perrin et al., 2014), le Baratin (Courthézon, Vaucluse; Binder, 1998; Gassin & Binder, 2004; Sénépart, 2009), les Petites Bâties (Lamotte-du-Rhône, Vaucluse; Binder, 1998, Binder, Jallot, & Thiébault, 2002) and la Baume d'Oullins (Le Garn, Gard; Binder, 1998; Roudil, 1987).

**Table 1:** Lithic assemblages directly studied and comparative assemblages

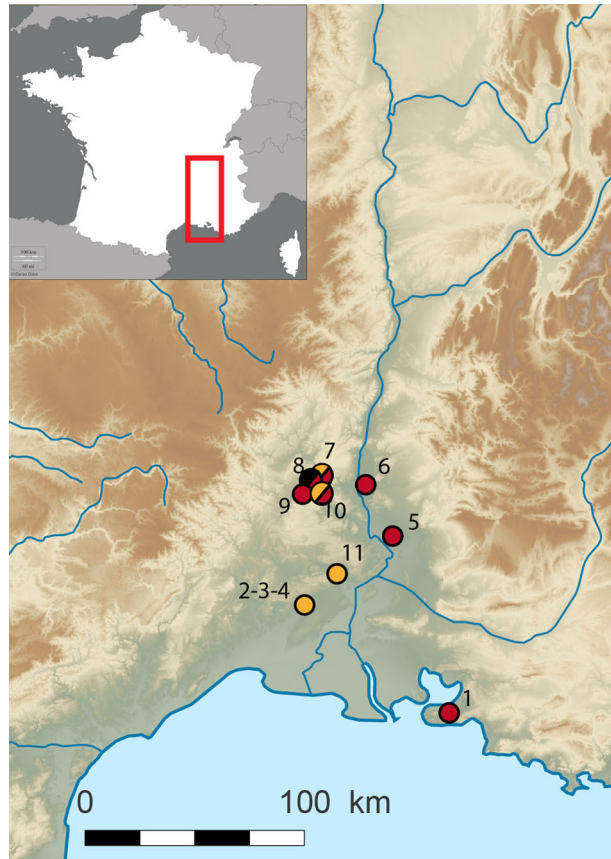
Assemblages	Ceramic facies	Date range (BCE)	Bibliography (for lithic industries)
<i>Montclus L.4</i>	Cardial	–5610/–5390	Defranould, 2019
<i>Montclus L.5</i>	Unknown	–5490/–5220	Defranould, 2019
<i>Montclus L.3</i>	Epicardial	–5300/–5000	Defranould, 2019
<i>Montclus L.2</i>	Epicardial	–5210/–4850	Defranould, 2019
<i>Baume de Ronze ensemble 1</i>	Cardial or Cèze-Ardèche-1	–5620/–5330	Defranould, 2019
<i>Baume de Ronze ensemble 2</i>	Unknown	Undated	Defranould, 2019
<i>Le Tai</i>	Epicardial	–5300/–5000	Defranould, 2019
<i>Aigle L.5</i>	Cardial	–5210/–4730	Defranould, 2019
<i>Oullins L.6</i>	Cardial	–5610/–4990	Bevilacqua, 1995; Binder, 1998
<i>Oullins L.5</i>	Epicardial	–5320/–4960	Bevilacqua, 1995; Binder, 1998
<i>Mas de Vignoles X</i>	Epicardial	–5210/–4950	Perrin, 2014
<i>Mas Neuf</i>	Epicardial	–5040/–4910	Perrin, 2014
<i>La Roussillonne</i>	Epicardial	–5000/–4730	Perrin, 2014
<i>Font-des-Pigeons L.11</i>	Cardial	–5000/–4730	Binder, 1987
<i>Font-des-Pigeons L.17-15</i>	Cardial	–5370/–5050	Binder, 1987
<i>Baratin</i>	Cardial	–5400/–4850	Binder, 1998; Gassin & Binder, 2004
<i>Petites Baties Sect. 2</i>	Cardial	–5370/–5050	Binder, 1998
<i>Petites Baties Sect. 4</i>	Post-cardial	–4840/–4620	Binder, 1998

The dating ranges are presented after statistical treatments, for primary data see: Binder et al., 2017b, Defranould, 2020; Binder, Jallot and Thiebault, 2002; Manen, in press; Manen et al., 2018; Perrin et al., 2014.

## 2.1 Chrono-Cultural Framework of the Sequence

Most of the selected assemblages are accurately dated by 67 radiocarbon measurements, which are considered to be reliable, i.e., they are carried out on short-lived samples with low standard deviations. Only ensemble 2 of Baume de Ronze has not been dated and the associated pottery productions are poorly characterised for the moment (Figure 2).

Thus, these data can be easily compared with the general chrono-cultural framework for the north-western Mediterranean and the South of France (Manen et al., 2018; Perrin et al., 2018). The Cardial/Epicardial sequence considered in this study can be divided into three stages:



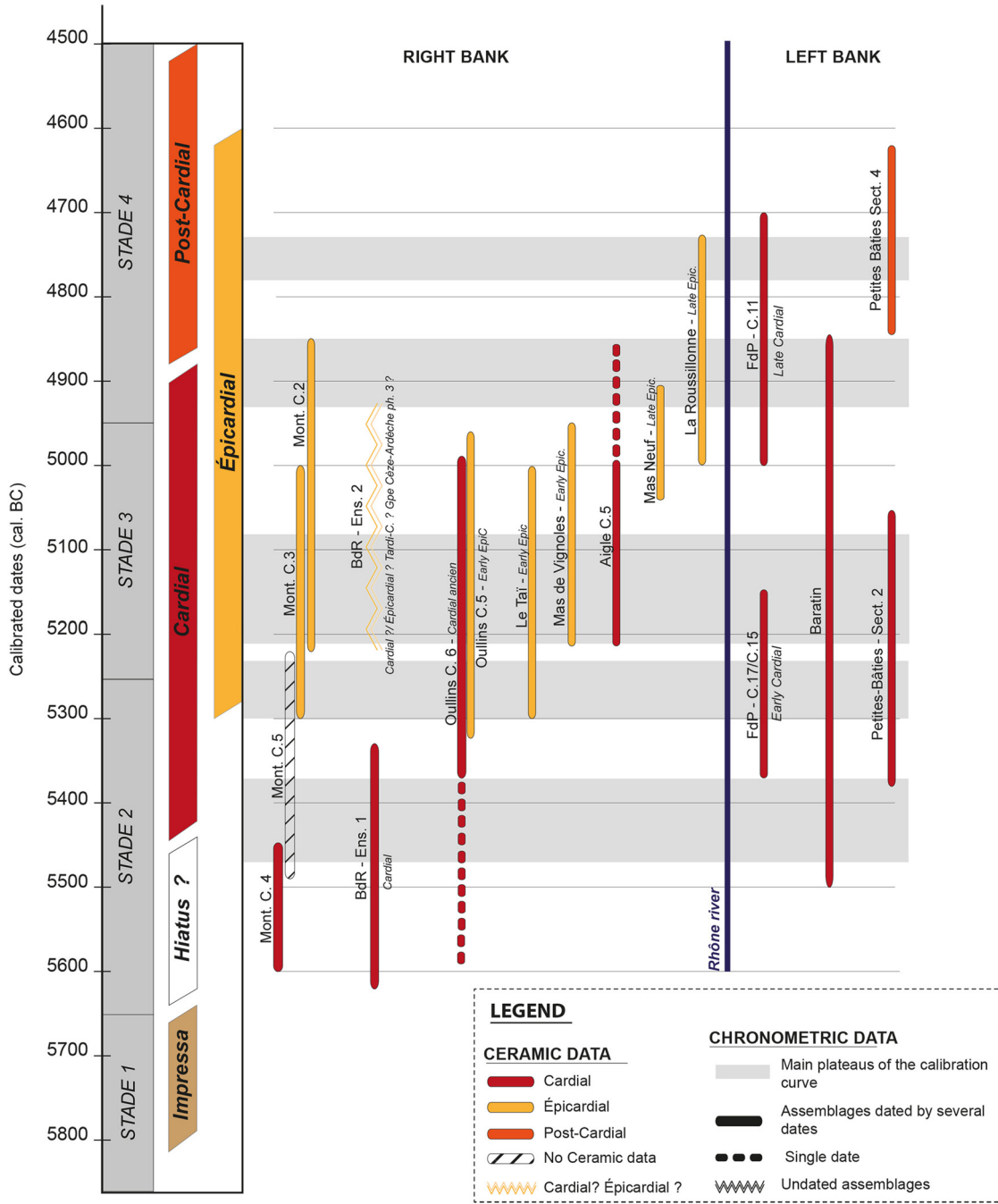
**Figure 1:** Distribution map of the sites of the corpus. In red, the sites attributed to the Cardial, in orange to the Epicardial. no. 1: La Font-des-Pigeons (Cardial), no. 2: Le Mas de Vignoles X (Epicardial), no. 3: Le Mas Neuf (Epicardial), no. 4: la Roussillonne (Epicardial), no. 5: le Baratin (Cardial), no. 6: les Petites-Bâties (Cardial), no. 7: Baume d'Oullins (Cardial and Epicardial), no. 8: Baume de Ronze (Cardial and indetermined Early Neolithic), no. 9: la grotte de l'Aigle (Cardial), no. 10: Baume de Montclus (Cardial and Épicardial), and no. 11: le Taï (Epicardial).

- Three Cardial assemblages, Montclus L.4, Baume de Ronze-1 and possibly Oullins L.6, can be dated between 5600 and 5400 cal. BCE, i.e., in the hiatus between the Impressa and the Cardial. These sites are, together with the Balma Margineda in Andorra, the only known sites in this chronological interval for the South of France (Manen & Guilaine, 2010; Manen et al., 2018).
- The second stage can be dated to between approximately 5300 and 5000 cal. BCE. It is at this time that the contemporaneity, on a radiocarbon scale, of the Cardial and Epicardial ceramic styles can be observed. Consequently, the articulation between these two facies can no longer be understood as strictly chronological, with one following on from the other.
- Finally, the last stage corresponds to occupations after 5000 cal. BCE. On the right bank of the Rhône, this stage is only associated with the Epicardial pottery facies.

### 3 Assemblage Variability and Lithic Industries

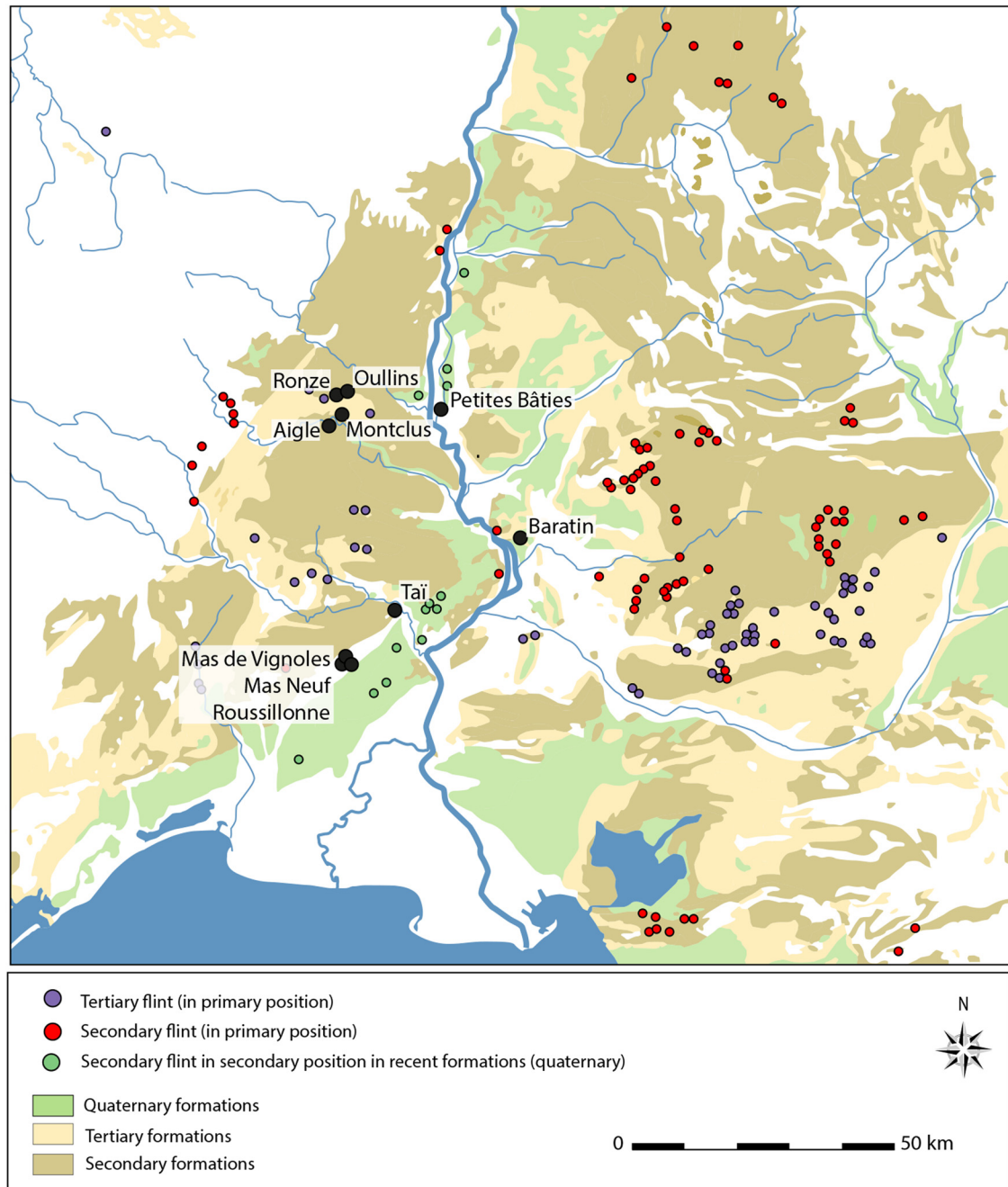
#### 3.1 A Recurring Operative Pattern

The geological environment of the Rhône corridor is rich in mineral and siliceous resources, which were largely exploited by Neolithic knappers (Figure 3). They can be divided into four main groups of raw materials:



**Figure 2:** Chrono-cultural articulation of the lithic assemblages of the corpus in conjunction with pottery and radiocarbon data (abbreviations: Mont.: Montclus, BdR: Baume de Ronze, FdP: Font-des-Pigeons, ÉpiC.: Épicardial). The grey bands illustrate the main plateaux of the calibration curve.

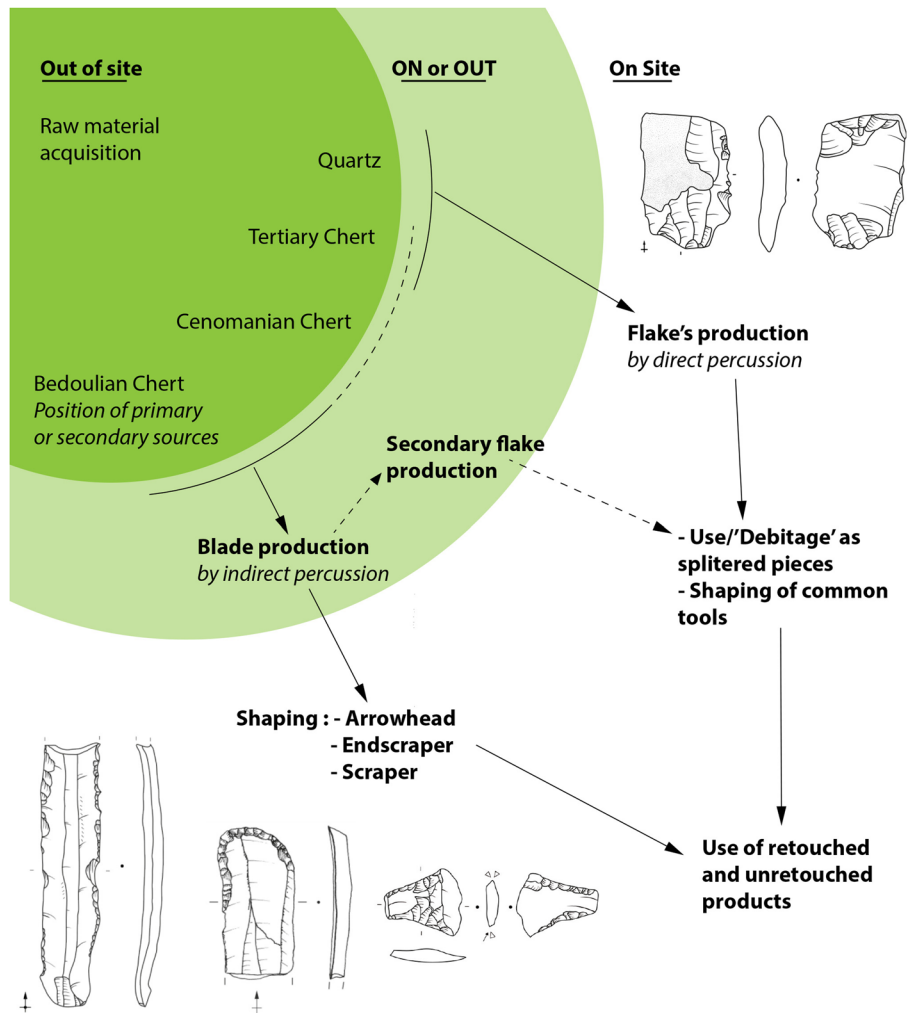
- Filonian quartz, of local origin, which is generally extracted in the form of pebbles from the alluvial deposits of rivers.
- Local Tertiary flints, which display a wide variety of colours, shapes and are also variably suitable for knapping. The known deposits for these flints are located on the western bank of the Rhône, in the Paleogenetic basins of the Gard and Ardèche rivers (Boccaccio, 2005). These resources are exploited on sites on the right bank, in the catchment basins of the Cèze and Ardèche rivers, and less than 10 km from the primary flint deposits.



**Figure 3:** Map showing the provenance of the different siliceous raw materials, after Perrin, 2014, modified.

- Cenomanian flints, generally rather marginal in the assemblages, come from the basin of Uzès (Boccaccio, 2005).
- Blond Bedoulian flints, with fine grains and homogeneous structure, are of very good quality and are particularly well adapted to knapping. Today, primary deposits of this material are known on the left and right banks of the Rhône; and also secondary deposits in the alluvial terraces of the river. The identification of differences between various provisioning sources requires specific analyses which have not yet been carried out (Delvigne, 2016; Delvigne et al., 2016; Tomasso, Binder, Fernandes, Milot, & Léa, 2019). At our scale of observation, only pieces with cortical elements allow us to distinguish between primary and secondary sources. Regardless, depending on the sites and the different sources exploited, this resource can be more or less exogenous.

Despite some variations, which we will discuss below, all the lithic assemblages present a recurrent *schema opératoire* which can be divided into two productions (Figure 4).



**Figure 4:** Recurrent operative pattern for Cardial and Epicardial lithic productions from the Lower Rhône valley.

On the one hand, part of the materials, mainly local resources such as quartz and/or Tertiary flint, are exploited for the production of non-standardised fragments. Products can be obtained by heterogeneous modes of production, by direct hard percussion, or possibly by percussion on an anvil for certain quartz cores. Flakes are then only rarely retouched to produce common tools. They can still, in some cases, be used as *pieces esquillées*. In the absence of a use-wear study on our corpus, the function of these *pieces esquillées* is still debated: use as an intermediate piece and/or as a core to produce small, more standardised flakes (e.g., Gassin & Binder, 2004; Le Brun-Ricalens, 2006).

The second operative chain is geared towards the production of regular good-quality flint blades, preferably in Bedoulian flints, and more rarely in Cenomanian and Tertiary flints. As we will see below, depending on the site, debitage can take place either on habitat sites or outside them. Whatever be the case, regular laminar supports are obtained by indirect percussion, as evidenced by the frequency of the plain or concave butts, the *angle de chasse* between 70° and 90° and the S-curved profile of the blanks. The most regular blades are then fractured by bending to obtain sharp arrowheads (various types of geometric bitruncations, with or without direct flat retouch). The rest of the laminar supports are also frequently

retouched in order to make common tools (end scrapers, scrapers, blades with backed edge(s), etc.) or used without retouch. Finally, certain by-products of this laminar operative chain, namely shaping and reshaping flakes, can also be used. In some cases, the laminar cores are recycled, once the volume has been depleted or following accidents, to produce flakes by direct hard percussion.

### 3.2 Variability of Production

Despite this recurrent *schema opératoire* and a high degree of homogeneity, lithic productions present a certain variability, which can be examined through a chronological, functional and/or cultural perspective.

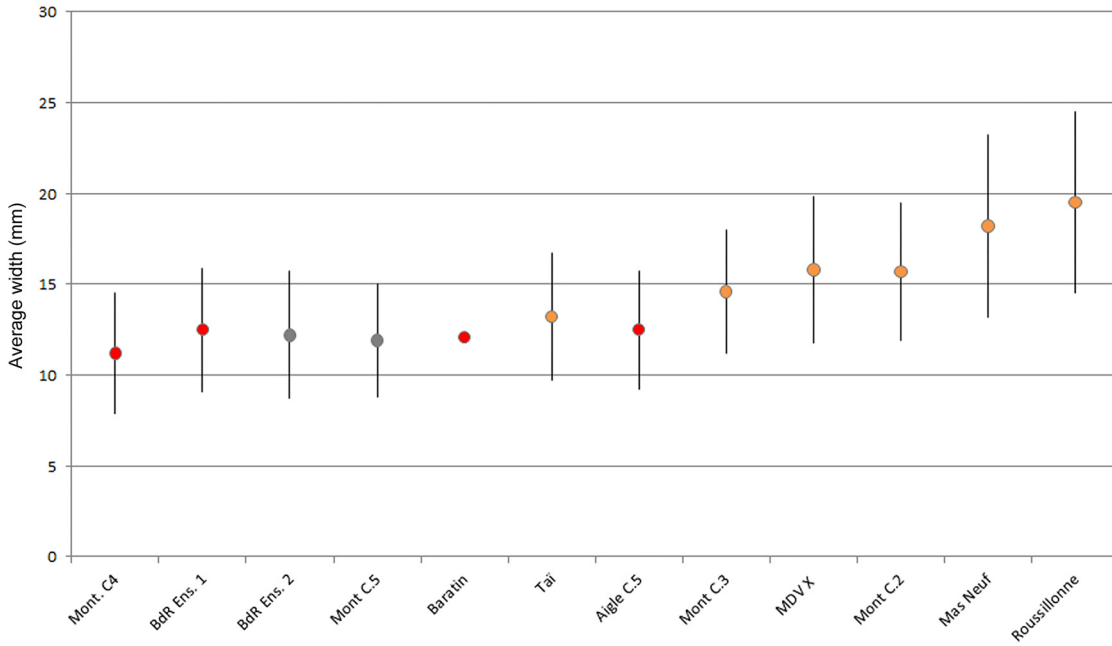
From a techno-economic point of view, differences can be discerned in the location of raw material sources in the geological environment, and the same local resources are not available at all sites. The techno-economic analysis distinguishes two different scenarios in the spatialisation of laminar operative chains, which seem to structure lithic productions. These rely on identifying whether Bedoulian laminar flint debitage took place at the sites themselves or outside them. The identification of *in situ* laminar flint debitage is based on the presence or absence of technical elements in the assemblages: laminar cores, primary flakes, core shaping/trimming elements, maintenance of laminar surfaces and to a lesser extent, crested blades and cortical blades. In several Cardial series, in layer 4 of Montclus, ensembles 1 and 2 of the Baume de Ronze, at Aigle Cave and Le Baratin, the presence of these diverse elements shows that the totality of these operative chains took place on site. Conversely, in the assemblages of Taï, the Petites Bâties, Montclus layers 2 and 3, Mas de Vignoles X, Roussillonne and Mas Neuf, only full debitage products are present, which shows that laminar blanks were knapped elsewhere and then brought to the sites (Binder, 1998; Defranould, 2019; Perrin, 2014). These elements point to the setting up of a circulation network of Bedoulian flint blades in our study area, during the Early Neolithic. However, due to the lack of petrographic characterisation of these Bedoulian flints, in particular, the absence of distinction between primary or secondary deposits, and provenance from the left or right bank of the river, it is not possible to reconstruct these circulation networks in detail.

Nonetheless, it does not seem possible to interpret Bedoulian flint laminar debitage through the perspective of the Cardial/Epicardial dichotomy. Most of the sites included in the circulation network are Epicardial (Taï, Mas de Vignoles, Roussillonne, Mas Neuf, Montclus layers 2 and 3), but the Cardial site of Petites-Bâties is an exception (Binder, 1998). Moreover, outside our study zone, the Cardial assemblages of Fontbrégoua (Salernes, Var; Binder, 1998), Lombard Cave (Saint-Vallier-de-Thiery, Alpes Maritimes; Binder, 1998) or even Corrège (Leucate, Aude; Guilaine et al., 1984) seem to rely on external contributions of Bedoulian flint blades.

On the other hand, the hypothesis of a chronological gradient could be a more pertinent key for understanding and interpreting the setting up of this network. Indeed, according to radiometric data, sites with pre-knapped Bedoulian flint blades are all posterior to about 5300 cal. BCE, which suggests that this diffusion network was set up from that time onwards.

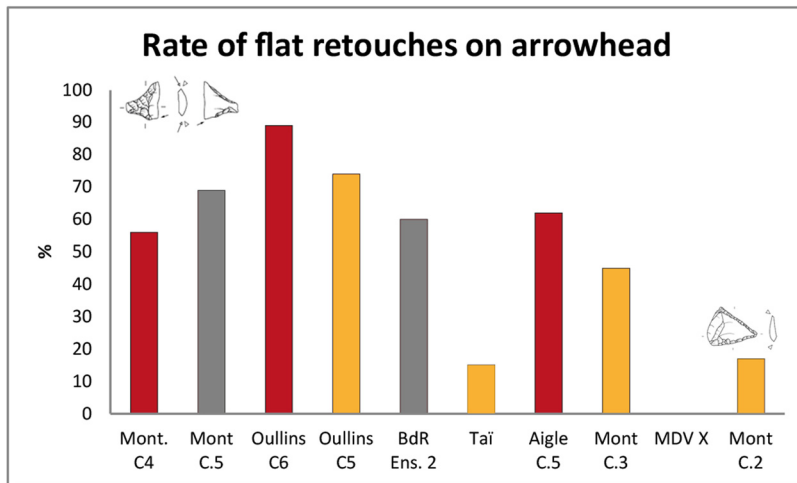
From a technological point of view, no major rupture is observed. Only the dimensions of laminar blanks seem to vary gradually over time. Average widths increase almost linearly throughout time (Figure 5), apart from an inversion observed for the blades of Taï (average width  $13.2 \pm 3.5$  mm), which are slightly larger than those from Aigle Cave ( $12.5 \pm 3.3$  mm). A student *t*-test between these two samples shows that the observed mean differences are significant (*p*-value of 0.03394). However, it is difficult to interpret this inversion. Two hypotheses can be put forward. The first is that the differences observed would indicate a cultural difference, with Cardial blades tending to be smaller in size than Epicardial blades. The second postulates that the assemblage from Aigle Cave would be slightly discordant in the corpus, which is also observed from the radiometric and ceramic data (Manen, 2000).

From a typological point of view, the composition of the toolkits appears to be relatively similar in all the series. A total of 811 tools were analysed, and the same types of tools and arrowheads are represented in Cardial and Epicardial assemblages (Defranould, 2019). From a functional point of view, the types of tools



**Figure 5:** Evolution of the average widths and standard deviations of laminar blanks throughout time. Assemblages attributed to the Cardial in red, Epicardial in orange. Mont. Montclus, BdR: Baume de Ronze, MdV: Mas de Vignoles, Rouss.: Roussillonne. Metric data from Binder, 1987, Defranould, 2019, and Perrin, 2014.

represented do not allow us to identify specialised activities, which is logical given that all the assemblages in the corpus are linked to habitats where various activities could be practised. The only variability factor observed in arrowhead types corresponds to a reduction in the number of arrowheads with covering retouch on the upper surface (Figure 6). Thus, at the beginning of the sequence, the corpora contain more than 50% of armatures with covering retouch, whereas at the end of the sequence, covering retouch is rarer, or even absent (e.g., at Mas de Vignoles). But here again, there is no clear segregation between Cardial and Epicardial assemblages, simply a possible tendency towards a decrease in this type of retouch in Epicardial assemblages, which generally comprise between 0 and 40% of pieces with this type of retouch, except for the assemblage from layer 5 of Oullins, which clearly differs from this model.



**Figure 6:** Evolution of the rate of flat retouch on the armatures in corpora with more than 10 elements. Assemblages attributed to the Cardial in red, Epicardial in orange, assemblages not associated with a pottery facies in grey. Mont: Montclus, BdR: Baume de Ronze, MDV X: Mas de Vignoles X. Data from Bevilacqua, 1995, Defranould, 2019, and Perrin, 2014.

In summary, if we cross-reference lithic and chronological data, we can propose an evolutionary model for lithic industries, divided into three stages (Table 2):

- An early stage, composed of Cardial ceramic assemblages, characterised by a laminar debitage of Bedoulian flints *in situ*, small blanks and the relative importance of flat retouch on armatures. Radiometric data position this group between 5600 and 5400/5300 cal. BCE. It is represented by the assemblages of layer 4 of Montclus and ensemble 1 of the Baume de Ronze, to which we can possibly add the Baratin (occupied over a long period of time, therefore potentially more recent, and with no data available for the arrowheads), layer 5 of Montclus (dated in keeping with this ancient stage, but with characteristics oscillating between the early and median stages, not characterised by pottery), Oullins layer 6 (with slightly more recent dating), the Baume de Ronze ensemble 2 (not dated, not characterised by pottery, but consistent from the point of view of lithic industries) and Aigle Cave (with lithic characteristics consistent with an attribution to the early stage, but discordant with radiocarbon measurements).
- A median stage with the coexistence of Cardial and Epicardial facies, dated between 5300 and 5000 cal. BCE. The setting up of the circulation network of Bedoulian flint blades seems to date from this period. This stage includes the assemblages of layers 2 and 3 of Montclus and Taï. We can possibly add the assemblages from layer 5 of Montclus, Baratin, Aigle Cave (see above) and Mas de Vignoles X (with dating consistent with the median stage, but lithic industry closer to the recent stage).
- Finally, the last stage consists exclusively of Epicardial assemblages located west of the Rhône. Chronologically, it is positioned in the first third of the fifth millennium, when the circulation of wide Bedoulian flint blades was established. It is composed of the Epicardial sites in the Nîmes plain, Roussillon and Mas Neuf; and possibly Mas de Vignoles X, which is very close to the first two in terms of its industry, but which is chronologically positioned in the middle stage.

This outline remains imperfect, due in particular to the scarcity of criteria for identifying distinctions. It requires refining through further comparisons, and the corpus needs to be extended to a wider geographical scale. Above all, the hypothesis of the setting up of a circulation network of Bedoulian flint blades needs to be further substantiated by petrographic analyses to ensure a better understanding of the spatialization of the operative chains.

Finally, in the light of recent work, the dating of the early stage prior to 5400 cal. BCE is discordant with the various chronological syntheses established on a larger scale (e.g., Binder et al., 2017b; Manen et al., 2018; Perrin et al., 2018). As far as we know, the occupations of the lower Rhône valley between 5600 and 5400 BC are chronologically and geographically isolated among the mass of Cardial dates from the South of France. Contemporaneous occupations in this chronological range are to be found in the Iberian or Tyrrhenian Cardial (Binder, 2013; García-Martínez de Lagrán, 2018; García-Puchol, Diez Castillo, & Pardo-Grodó, 2017; Rojo-Guerra, García-Martínez de Lagrán, & Royo-Guillén, 2018). There are many possible explanations for this hiatus in settlement, or for the scarcity of data in this chronological bracket (state of research, problems in the analysis of samples from this period, taphonomic bias or archaeological reality), but none seems satisfactory at present. It is difficult to invoke a problem in radiocarbon counting or measurements, since dates in this range are available in other regions. It is still possible, following the example of a hypothesis formulated in an article by Manen and Guilaine (2010, p. 182), to suggest that erosive processes linked to climatic instability between 5400 and 5200 cal. BC (Berger, 2005) caused some of the previous occupations to disappear. But in this case, it would be necessary to explain why sites in the lower Rhône valley have been spared by these taphonomic processes.

## 4 Conclusion

If we go back to the different hypotheses put forward in the introduction to understand the articulation of these two Cardial and Epicardial facies, we can now outline several answers.

**Table 2:** Phasing proposal for the Early Neolithic lithic industries in the lower valley of the Rhône

Chronology (cal. BCE)	Lithic features	Reliable assemblages	Potential assemblages
Recent stage 5050–4750	<ul style="list-style-type: none"> <li>– Blade’s production outside of sites</li> <li>– Large blades</li> </ul>	Mas Neuf, Roussillonne	Mas de Vignoles
Middle stage 5300–5000	<ul style="list-style-type: none"> <li>– Probable blade’s production outside of site</li> <li>– Middle-sized blades</li> <li>– Less importance of flat retouche on the arrowhead</li> </ul>	Montclus L.3 & L.2, Le Tai	Aigle, Oullins L.5, Montclus L.5, Mas de Vignoles
Early stage 5600–5400/5300	<ul style="list-style-type: none"> <li>– Blade’s production on the sites</li> <li>– Small blades</li> <li>– Importance of flat retouches on the arrowheads</li> </ul>	Montclus L.4, Ronze ens. 1, Baratin	Montclus L.5, Ronze ens. 2, Oullins L.6, Aigle

From a chronological point of view, the first stage seems to be exclusively Cardial. Then, the contemporaneity of the Cardial and Epicardial facies is confirmed, on the radiocarbon resolution scale, in the 5300–5000 BCE range.

From a cultural point of view, it must be noted that the differences observed in ceramic production between the Cardial and Epicardial are not found in lithic industries. There does not seem to be a tradition of Cardial and Epicardial debitage, which further reinforces the link between these two entities. The variability observed in pottery production is probably based on cultural or social factors, but it does not concern all Early Neolithic societies and their production systems. These two technical sub-systems do not evolve at the same pace. We can put forward the hypothesis that they were implemented within human groups by different craftsmen, knappers and potters, who introduced innovations in their way of doing things in a disconnected way, which implies that societies were already segmented and specialised.

Finally, from a functional perspective, it should be pointed out that only perennial settlement sites have been studied. Specialised sites, if they exist, are lacking in our study area. In the hypothesis of the setting up of the Bedoulian flint blade circulation network, we still lack blade-producing sites, in order to understand the geographical, social, economic and functional organisation of this exchange and circulation network.

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