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The late Mesolithic of Western Europe: origins and diffusion of blade and trapeze industries

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Summary: During the 7th millennium cal BC, Mesolithic assemblages record a major change throughout the entire European continent. This change took place in a very rapid manner. The aim of this paper is to determine possible origins of this phenomenon and to define the chronological stages of its spread. Critical examination of the radiocarbon dates and the sites make an African origin of this phenomenon likely, which subsequently diffuses very rapidly across the entire Western Mediterranean Basin before expanding across the whole of Western Europe. Equally, we are also trying to understand its proper nature: introduction of a new technical concept or migration of culturally distinct human groups?

Keywords: late Mesolithic, Western Europe, Northern Africa, lithic assemblages, radiocarbon dating, diffusion

Between the end of the 8th and the 6th millennium cal BC, a major change can be perceived in the chipped stone industries of the Mesolithic populations throughout the entire European continent (excepted for the British Isles) and in Northern Africa. This change is marked by the sudden appearance of large and regular flint bladelets, removed either by pressure or by indirect percussion, two techniques clearly opposed to the former practices known for those geographical areas. These bladelets are then transformed by retouch to obtain notably two tool types which are widespread in the whole considered area: trapezoidal arrowheads (“trapezes”) and laterally notched bladelets, often called “Montbani blades”. The originality of the assemblages was already noted in the first half of the 20th century (October 1921), but is only globally recognized in the 1950s by J.G.D. Clark who described them as “blade and trapeze industries” (Clark 1958). For this author, these industries testify to a first colonisation of Europe, 1000 to 1500 years prior to the Neolithic. Later, this phenomenon has been studied and mapped notably by S.K. Kozłowski, with his “K trend” (Kozłowski 1976). Until recently, the global interpretation of this Late Mesolithic has hardly undergone any revision regarding both its origins and the pace of its diffusion. In order to clarify these topics, several European programs of research have been started from 2008 (Perrin *et al.* 2009) and they are currently still in

progress (ANR « Méso-Néo : Les derniers chasseurs-collecteurs en Europe occidentale » headed by P. Allard). Two complementary approaches have been developed. The first aims at defining the chronological framework more precisely in order to identify a possible original area of this phenomenon and to establish the pace of expansion. This is the topic of the present study. A second approach evaluates the technical modalities and the typological standards of all these industries in detail at a European scale (see Allard *et al.*, this volume).

Method

The expansion of blade and trapeze industries being pan-European, we have extended the study to a very large area (figure 1). Our first aim was the listing up of sites with trapezes dated to the 7th and 6th millennium in a common database as well as the compilation of all available radiocarbon dates. Actually, this database contains almost 550 sites and 560 dates. All these data are, however, not equally reliable and thus we have undertaken a critical analysis in order to proceed to classification. The sites have been ranged according to a three-stage scale. The first assemblage of sites is composed by archaeological layers or sites without detected postdepositional disturbance accompanied by conclusive dating on reliable material (short life charcoals, seeds, bones). This group contains merely 40 sites, representing hardly 5% of the total. The second assemblage consists of sites associating radiocarbon dates and archaeological objects within the same layer but with difficult or debatable relations. This group assembles about 80 sites. The some 430 sites belonging to the third group are undated or affected by stratigraphical disturbance and thus of only secondary interest for our problem. Discussion on the origin and the spread of these lithic industries is based on the first group, the second one providing primarily additional information concerning knapping techniques or tool styles on a rather regional scale. About thirty new radiocarbon dates have been performed in the two successive programs of research (Perrin *et al.* 2009, and figure 2) which, measured by the harsh criticism regarding the ancient dates, permit to refine the chronological interpretation of this phenomenon at a European scale. This renewed analysis of the radiocarbon dates of the Late Mesolithic also allows shortening this phenomenon by 800 years compared to the duration that was commonly believed.

The chronological stages (fig. 3)

Before 6600 cal BC: first evidence

The earliest evidence for bladelets and trapeze industries in Western Europe is recovered first of all from Sicily (grotta dell'Uzzo), and furthermore from the southernmost part of the Italian Peninsula (Latronico 3). These industries use at least partly pressure technique for the production of bladelets (Binder *et al.* in press).

It is possible that the sites of the trapeze Mesolithic situated on the eastern shores of the Adriatic Sea can also be dated to this first stage. Nonetheless, the lack of reliably dated and published

stratigraphical contexts leaves this point hypothetical. At the end of this first stage, at about 6600 cal BC, the phenomenon seems to reach the Northern Alpine region already, in particular the Trentino hosting the Romagnano shelter. In the current stage of documentation, this site remains, however, rather isolated. Its presence tends to reinforce the assumption of a spread along the Adriatic coast originating from Southern Italy.

As a consequence, the question of the proper origin of these Italian industries with trapezes and pressure technique has to be asked. In the literature, the Franchthi shelter, on the Eastern coast of Greece, is often considered to hold the first evidence for trapezes in the Mediterranean Basin. The sedimentological units VIII and IX of this site which has a long and complex stratigraphical sequence have indeed yielded trapeze industries dated to the 8th millennium cal BC (Perlès 1987). However, this site is problematic in so far as it is isolated from any archaeological occupation cluster and as the recovered trapezes are themselves very distinct compared to those found later (pieces with bifacial retouch or bitruncations on flake). The almost complete absence of blade debitage reinforces the singular position of this site.

More interestingly, with regard to our problem, is the fact that the first occupation of the Upper Capsian in North Africa seems to establish at the same period (in particular in Algeria and Tunisia) with industries characterised by blade debitage with pressure technique and by the production of symmetric trapezes. There's an undeniable technological proximity with southern Italy industries, which allows us to presume a possible link, despite the scarcity, even the complete lack of well-documented and well-dated stratigraphical contexts.

Between 6600 and 6400 cal BC: the Mediterranean "flash"

During the second half of the 7th millennium cal BC, a strong and rapid spread of the phenomenon occurs over the entire western Mediterranean basin thus including Italy, possibly an important part of the Adriatic coast and south-eastern France. This area pertains to the Castelnovian (western Languedoc possibly excepted) and presents rather similar production techniques. During this stage, the phenomenon also reaches the Mediterranean coast in Spain (Cocina I facies). The use of pressure technique is attested almost throughout the entire geographical area, simultaneously to indirect percussion used for the removal of bladelets. Thus this Mediterranean "flash" seems to correspond to the diffusion of the technical system as a whole, perhaps through the moving of populations.

Between 6400 and 6000 cal BC: Atlantic Expansion and Environmental Crisis

During the centuries following this Mediterranean spread, the phenomenon rapidly reaches the Atlantic Coast spanning from the Algarve to Brittany. Most part of the southwest European continent thus depends on industries with broad blades and trapezes. In southwestern France, some areas, however, seem to remain marginal to this process, for example the Quercy region, where the

Sauveterrian tradition is attested at least until about 6300/6200 cal BC (Valdeyron *et al.* in press). Between approximately 6250 and 6100 cal BC, a strong environmental crisis termed « 8200 cal BP climatic event » affects the entire northern hemisphere as a consequence of thermohaline alteration in the Atlantic Ocean (Alley and Ágústssóttir 2005). The effects have been quite diverse according to the different regions. In the Mediterranean area, refreshing and striking aridity of the climate seems to be registered. Obviously, this cannot be put in direct relationship with this event, but the almost complete absence of late Mesolithic sites can be observed in the coastal zones and the flood plains from 6000 cal BC on, i.e. by the moment when ecosystems are durably and deeply altered, in the entire Italian peninsula and even in Southern France. At the same period human groups bearing Castelnavian traditions reach the Northern Alps in France sometimes at high altitude locations. Simultaneously, the Jura mountains are occupied. In contrast to the Mediterranean area, the Atlantic Coast shows a strong occupation growth in Portugal as well as in Brittany.

From 6000 to 5600 cal BC: continental stabilisation

In the Mediterranean area, notably in the southernmost part of the Italian peninsula, the arrival of the first Neolithic colonists brings this expansion to an end. In the actual state of research we ignore whether the arrival of farmers caused the disappearance of Mesolithic groups with blade and trapeze industries or, on the contrary, if Neolithic expansion commenced in areas with sporadic or lacking Mesolithic occupation. Spain seems less concerned by the phenomenon as this period is characterised by the development of the Cocina II facies, an industry apparently showing strong affinities (Cocina triangles) with North African assemblages (Upper Capsian). During this period an important late Mesolithic occupation develops on the Atlantic coast as shown by the cemeteries built in shell middens (Téviec and Hoedic in Brittany, Moita do Sebastião and Cabeço da Amoreira in Portugal). These industries, by now reliably present in southwestern France, are also attested in the entire Paris Basin and even as far as Flanders. This first half of the 6th millennium thus seems to correspond to a stage of concentration of these industries in the continental area, simultaneously to the expansion movement in the northern direction.

From 5600 to 5200 cal BC: at the margins of the Neolithic

From 5600 on, these Mesolithic industries disappear nearly totally from the Mediterranean basin which are by now comprised entirely of the early Neolithic. Some rare cases are, however, observed on the margins of the neolithic expansion, as for example in south-western France at Cuzoul de Gramat, at the shelter of La Grande Rivoire in the Upper Rhone valley as well as in the southernmost tip of Portugal. Further north, Neolithic farmers of the Linear Pottery Culture establish themselves in the Rhine area and then in the Paris Basin, from about 5300 cal BC onwards. Until this date, the

mesolithic industries are nonetheless well attested and this stage corresponds to substantial concentration in Central France, in Brittany as well as in Northern Belgium.

After 5200 cal BC: always farther north...

At the very end of the 6th millennium, the largest part of Western Europe has become neolithised. The persistence of blade and trapeze industries in distinct, extremely localized regions mirrors the last groups of hunters. Seemingly, this is the case in Southern Portugal and in the Jura mountains. Examples for coexistence of two population groups can be recorded here at about 5200-5000 cal BC (Perrin 2003). Simultaneously, during this stage, Linear Pottery groups reach the shores of the Atlantic and the Channel creating possibilities of contact here too. Further north, at the beginning of the 5th millennium, the Swifterband industries are characterised by the presence of symmetrical trapezes: consequently, the concept of trapezes does not subside within the Neolithic and thus possibly reflects the existence of contacts. The arrival of the Danubian Neolithic in Northern France causes the rapid decline of the last Mesolithic groups and more likely their absorption by the new farming communities. However, it should be noted that trapezes do not disappear as they will be adopted by the first Neolithic populations in the north (the so called “danubian arrowhead”). The latter reproduce with very close affinities arrowheads of hunter-gatherer type. From 5000 cal BC on, these industries are solely attested northwards, in Belgium and to a larger extent in the Low Countries and in Denmark.

Where does the late Mesolithic originate?

The classification of the known site locations and the criticism of the available radiometric dating allowed us to map the diffusion phenomenon of these blade and trapeze industries. It appears quite clearly that the first locations within the study area are situated in the Mediterranean and more particularly in Sicily. It is yet impossible to define the precise original area and a number of hypotheses remain open to discussion. The first and most obvious hypothesis regarding the south-north direction of the spread consists of situating this origin in Northern Africa. The Upper Capsian has indeed yielded trapeze industries and pressure technique which show extremely close similarities to the Castelnovian or the Cocina I Mesolithic in Eastern Spain. Unfortunately, Upper Capsian stratigraphical contexts are generally unreliable and very poorly dated. Despite the lack of reliable contexts, recent investigations demonstrate the existence of a clear disruption in the prehistoric settlements between the Typical Capsian and the Upper Capsian (Rahmani 2004). This change represents the transition between two stages of the Mesolithic and is characterised by the appearance of debitage by pressure and of notched blades. According to the author, the emergence of the Typical Capsian occurs prior to 8000 ± 200 BP, which means at about 7100-6600 cal BC, during a stage which

precedes the layers of the Uzzo Cave, thus reinforcing the hypothesis of a Northern African origin of this phenomenon.

A second hypothesis currently advanced, locates the origin of these industries in Ukraine or Crimea. Indeed, only in this part of Europe trapeze industries are associated with high dates from the 9th millennium on (Murzak-Koba group). Nonetheless, the understanding of this northern diffusion, which may have functioned similarly to the spread of the Neolithic in Central Europe one millennium later, suffers from insufficient and unreliable dating in Central Europe. Thus, trapeze industries of Poland (Janislawice culture) are not dated prior to 6100 cal BC, if we consider the data actually available. Elsewhere, hints for earlier dating exist but seem to be isolated cases. Moreover, the diffusion scenario which we could establish in this research project argues strongly against this hypothesis as no early dated site fill the gap between the Mediterranean Sea and the Black Sea. Once again, the stratigraphical reliability of the site locations as well as that of the dating remains very questionable.

The hypothesis of an Eastern Mediterranean origin (i.e. Franchthi) is particularly recapitulated in the recent work of S.K. Kozłowski (this volume). Indeed, the author identifies two distinct routes of diffusion of the trapeze industries. The primary pertains to Western Europe and corresponds to the phenomenon analyzed in the present study. The second bypasses the Balkan Peninsula and crosses continental Europe from south to north, from the Aegean (and thus perhaps from Franchthi) up to the Baltic States. The available technological data favour this assumption since the Balkan route would correspond to the diffusion of the trapeze « concept » except for the latter neither being associated with the types of blade debitage or production nor with notched blades, for example. Seemingly, these are two distinct processes.

Nature and Pace of the Change

Another unanswered question remains the one of the proper nature of this spread. Do we deal with migrations of populations or with the diffusion of a technical concept? This spread is not merely restricted to some new items exchanged by long distance trade but rather applies to an assemblage including the production of regular bladelets by the use of an intermediate tool (pressure or indirect percussion), a new mounting method of arrowheads of which the shapes undergo continuous modifications during the whole late Mesolithic and finally, the generalized use of notched blades, with rather unchanging characteristics. Although these three elements are interdependent (the blades are the blank production of the two concerned tools), they are not necessarily interconnected: trapezes can be produced without these blades, and notched blades can be used without hunting with trapezes. In other terms, this association is contingent and the fact that the three elements appear and diffuse during the same time period reinforces the assumption of the existence of coherent social phenomena which imply the whole group or a part of it. Furthermore, all the shores of the Western Mediterranean Basin are concerned by this sudden change in technology within only a few centuries. Consequently, we deal

with an extremely rapid expansion and even if it obviously remains extremely difficult to propose an anthropological interpretation for this process, the hypothesis of a population movement cannot be excluded.

At about 6400 cal BC, the phenomenon stabilizes on the Mediterranean shores, probably marking a period of territorial consolidation before expanding north- and westwards. Nonetheless, the modalities of this diffusion are slightly different. Before, a “package”, a technical system as a whole seems to be diffused. From then on, it seems to be symptomatic to observe that the use of pressure technique is abandoned although the knappers still produce large blades intended for the fabrication of trapezes. Distinct re-combination of the technical system may have occurred during the mid-7th millennium, and only the concepts of large blades and trapezes diffuse. Abandoning pressure technique is accompanied by a diversification of trapeze types showing regional variability.

Conclusion

The Late Mesolithic of Western Europe is characterised by a deep change concerning the technical systems of lithic production. Critical analysis of the available radiocarbon dates and the sites show that its origin can very likely be located in Northern Africa and that it subsequently expands rapidly across entire Europe. But this phenomenon of course is much more complex than a simple movement of south-north oriented expansion. In the Mediterranean Basin, this extremely rapid expansion concerns the entire technical system suggesting a possible movement of population (which of course has to be demonstrated more precisely). Beyond, the phenomenon remains rapid, albeit arrhythmic, and corresponds rather to the diffusion of a technical concept (the one of the production of large blades intended for the fabrication of trapezes and notched blades). Here, one would be confronted rather with the spread of the concept which is recombined and adapted regionally within the preceding groups. In the future, this collaborative research will focus more and more on the exploitation of reliable stratigraphical contexts rather than on the analysis of the new technical package as the latter is subject to various changes under environmental and/or cultural adaptations. However, all other evidence of social, economical or environmental changes will be taken into account, given that we perceive mainly the « stone » expression of a major historical phenomenon affecting the European continent.

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Figures

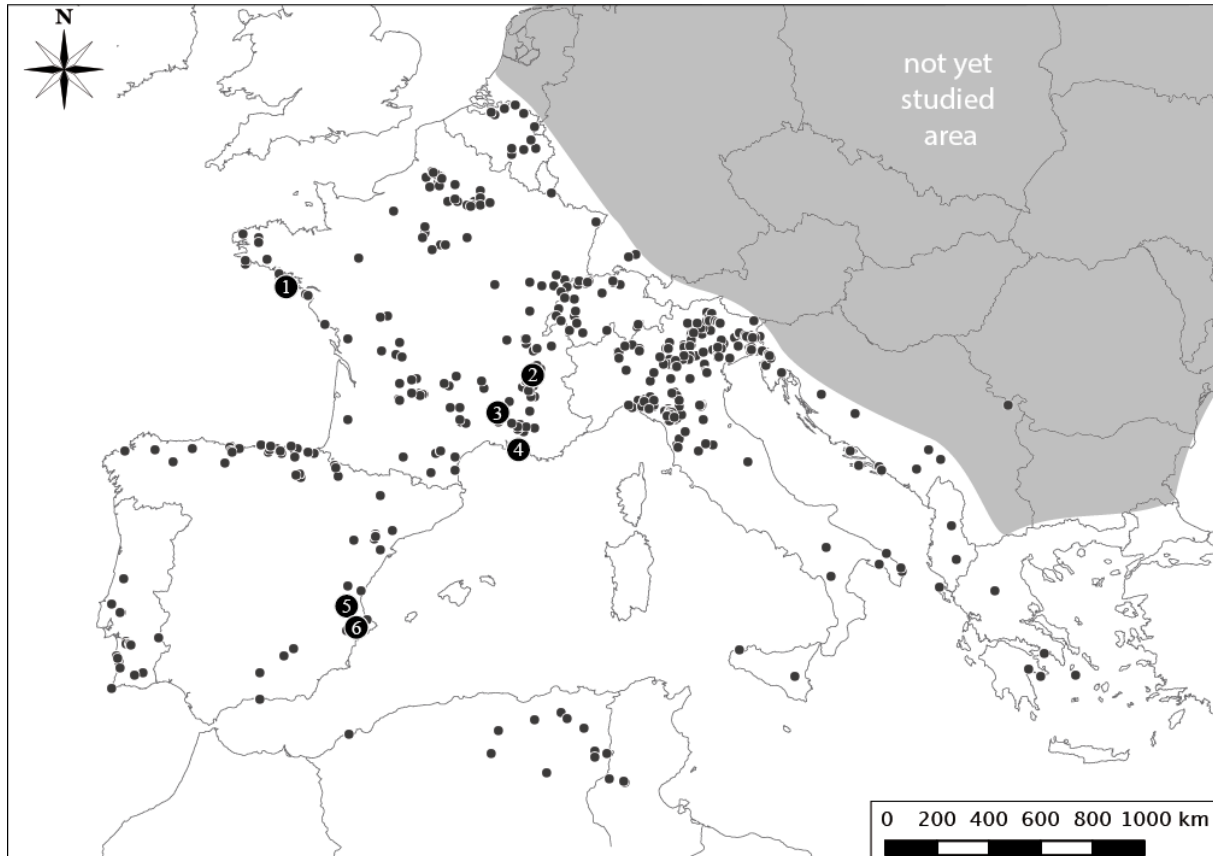


Figure 1. Study area and radiocarbon dated sites. 1. Beg-er-Vil (Quiberon, Morbihan, France); 2. Abri de la Grande-Rivoire (Sassenage, Isère, France); 3. Baume de Montclus (Montclus, Gard, France); 4. Grand Abri de la Font-des-Pigeons (Châteauneuf-lès-Martigues, Bouches-du-Rhône, France); 5. Cueva de la Cocina (Dos Aguas, Valencia, Spain); 6. Abrigo de la Falguera (Alcoy, Valencia, Spain).

Site	Layer	Cultural attribution	Sample	Reference	Conventional Age	2s calibration
Beg-Er-Vil	niv. 6	Teveician	seed	Beta-253153	7210 +/- 50 BP	6212-6003
Beg-Er-Vil	niv. 6	Teveician	charcoal	Beta-253154	7300 +/- 50 BP	6250-6051
Beg-Er-Vil	niv. 6	Teveician	seed	Beta-259108	7340 +/- 40 BP	6350-6073
Cocina I	sect. E1, c.12	MR fase A	bone	Beta-267438	7350 +/- 40 BP	6357-6080
Cocina I	sect. E1, c.13	MR fase A	bone	Beta-267439	6760 +/- 40 BP	5725-5621
Cocina I	sect. E1, c.17	MR fase A	bone	Beta-267440	7610 +/- 40 BP	6565-6401
Cocina II	sect. E1, c.6	MR fase B	bone	Beta-267435	6840 +/- 50 BP	5837-5639
Cocina II	sect. E1, c.8	MR fase B	bone	Beta-267436	7080 +/- 50 BP	6051-5846
Cocina II	sect. E1, c.10	MR fase B	bone	Beta-267437	7050 +/- 50 BP	6022-5811
Falguera VII	fase VII, niv. IIIa	MR fase A	bone	Beta-267441	7380 +/- 40 BP	6380-6099
Font-des-Pigeons	c.18G	Castelnovian	seed (Cerealia)	Beta-267434	6250 +/- 40 BP	5315-5071
Grande-Rivoire	d26	MR	bone	Beta-282246	6510 +/- 40 BP	5545-5373
Grande-Rivoire	d28	Castelnovian	bone	Beta-282247	6490 +/- 40 BP	5527-5368
Grande-Rivoire	d28	Castelnovian	bone	Beta-255118	6430 +/- 50 BP	5478-5320
Grande-Rivoire	d30	Castelnovian	bone	Beta-255119	7310 +/- 40 BP	6236-6071
Grande-Rivoire	d34	Castelnovian	bone	Beta-282248	7790 +/- 40 BP	6688-6506
Montclus	c. 4A	Early Neolithic	bone	Beta-253158	6550 +/- 40 BP	5614-5395
Montclus	c. 5	Early Neolithic	bone	Beta-253159	6360 +/- 40 BP	5469-5227
Montclus	c. 7	Castelnovian	bone	Beta-253160	6660 +/- 40 BP	5656-5511
Montclus	c. 10B	Castelnovian	bone	Beta-253161	6990 +/- 40 BP	5983-5769
Montclus	c. 12A	Castelnovian	bone	Beta-253162	7170 +/- 50 BP	6206-5923
Montclus	c. 13B	Castelnovian	bone	Beta-253163	7190 +/- 50 BP	6210-5986
Montclus	c. 14B	Castelnovian	bone	Beta-253164	7320 +/- 50 BP	6346-6060
Montclus	c. 16	Castelnovian	bone	Beta-253166	7670 +/- 50 BP	6603-6436
Montclus	c.15	Castelnovian	bone	Beta-255115	7770 +/- 50 BP	6682-6480
Montclus	c.18B	Sauveterrian	bone	Beta-255116	7800 +/- 50 BP	6767-6485

Figure 2. Listing of radiocarbon dates realised by the Fyssen research program (Perrin *et al.* 2009) and the ANR « Méso-Néo : Les derniers chasseurs-collecteurs en Europe occidentale » headed by P. Allard. All the dates have been calibrated with Calib6.0 (Stuiver and Reimer 1993).

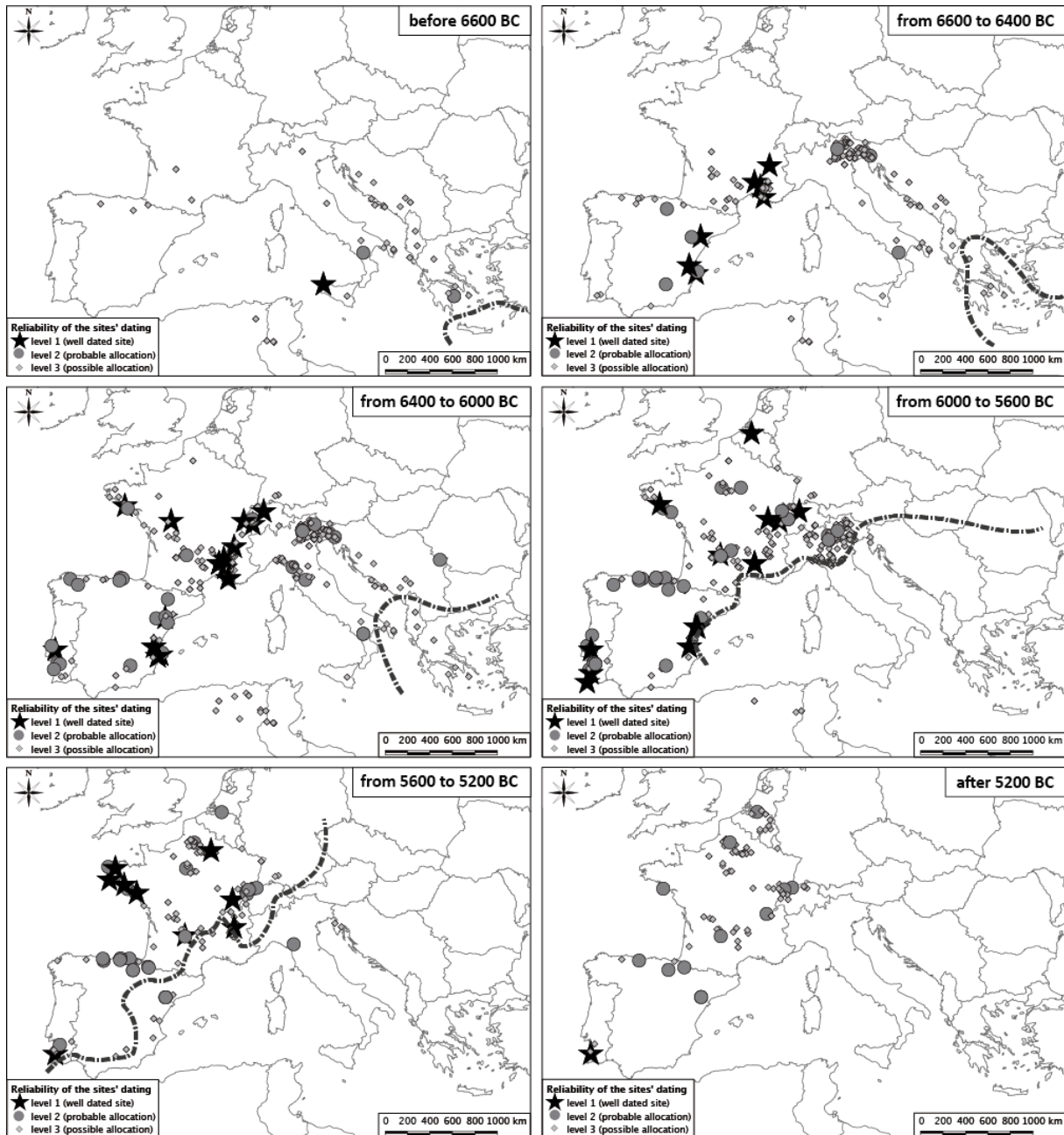


Figure 3. Chronological stages of the late Mesolithic (trapeze and regular bladelets industries) in Western Europe. The dashed lines show the expansion limit of the Neolithic for each one of the stages.