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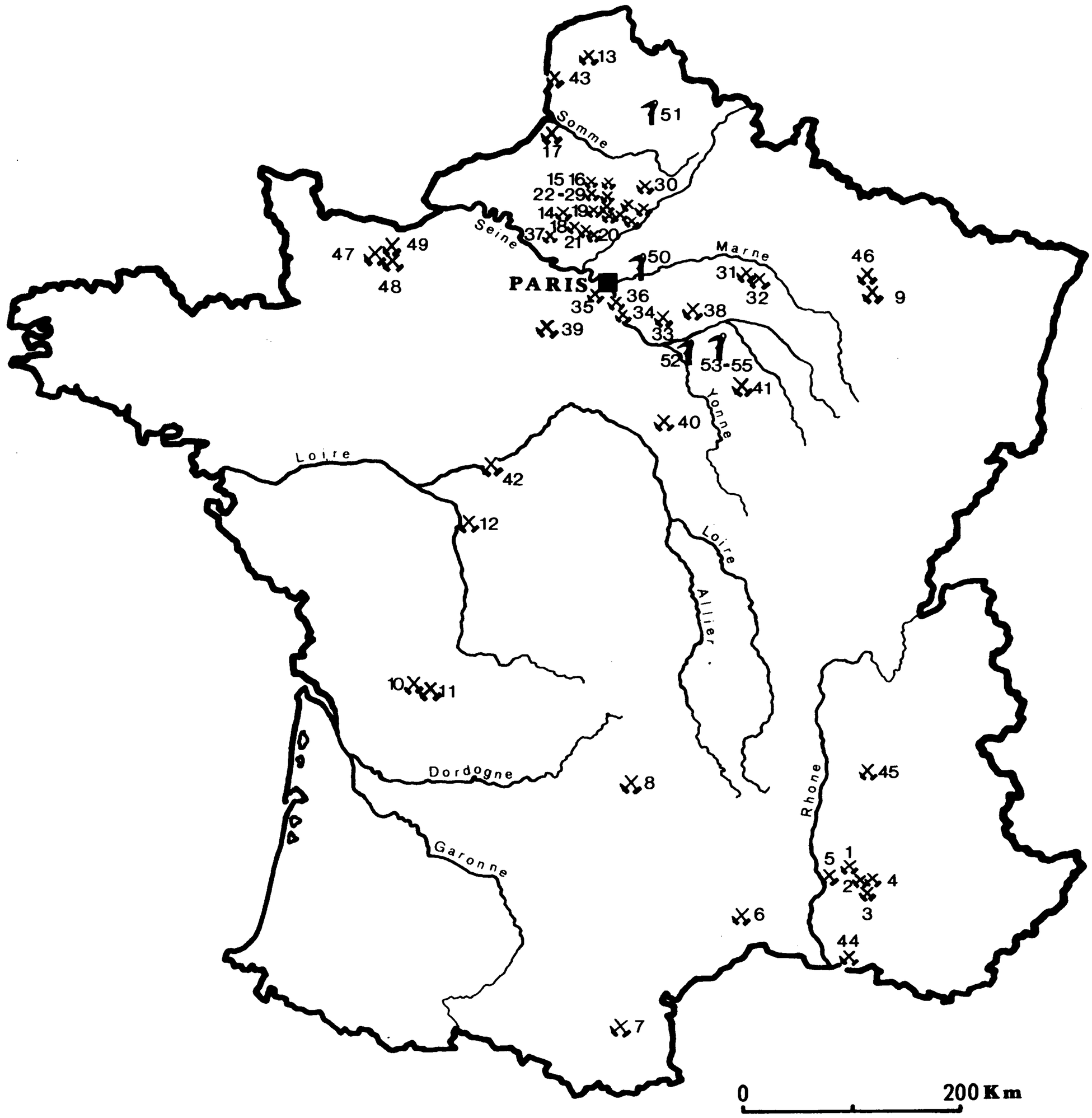

F France

F 1 Veaux near Malaucene
F 2 Murs
F 3 Gordes, valley of Largue
F 4 Valley of Largue
F 5 Mourre de la Cabane
F 6 Vigne du Cade
F 7 Cennes-Monesties
F 8 Mur-de-Barrez, Bellevue
F 9 Commercy
F 10 La Petite-Garenne
F 11 Les Martins
F 12 Grand Pressigny
F 13 Lumbres
F 14 Champignolles
F 15 Auchy-la-Montagne
F 16 Fourquerolles
F 17 Frocourt
F 18 Jamericourt

No workshop was found, but a few lithics were found trapped in the filling of the features. There are no indications or remains that might indicate the location of the miners' settlement.

A limited number of red deer antler implements (13 artefacts) was found. They are similar to the artefacts found in Villemaur "Le Grand Bois Marot"; only tines were used. Their basis sometimes shows the same hafting modifications as at Villemaur. The abrasion of the tools is strongly marked. Typical of the final Neolithic, an axe socket found in Pâlis could confirm the chronological attribution proposed for the antler technology that characterize Le Grand Bois Marot. The limited use of antlers was connected with the the geology of the flint deposit.

There is currently no available radiocarbon datation.

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F 54 VILLEMAUR-SUR-VANNE "LE GRAND BOIS MAROT", AUBE DISTRICT

Pierre-Arnauld de Labriffe, Anne Augereau and Isabelle Sidéra

The rural district of Villemaur is located about 40 km east of Sens (Yonne) and 20 km west of Troyes (Aube) in a small region called "Pays d'Othe" (see catalogue entry F 52, fig. 1). The site lies on the western side of a small dry valley leading to the Vanne River 1 km away (Fig. 1).

This site has been famous for a long time and it is mentioned as far back as 1882 as the largest workshop in the region (Salmon 1882). Although it was forgotten by the scientific community, the site has been the purpose of intensive surface collectings during the first part of the twentieth century. In the 1950s, C. Drioton (1954), a local amateur, carried out a limited excavation before the construction of a small railway.

The site was to be crossed perpendicularly by the construction of the A5 motorway, an evaluation was therefore carried-out, after which an excavation was decided upon.

As the site lies on a hillside orientated to the east, erosion was not severe and the Coniacian chalk is deeply covered with a thick mantle of silt. The accumulation of sediments enabled a good preservation of the debitage concentrations. On the other hand, the local situation of raw materials was less favourable.

Under the Neolithic soil, a layer of red-brown plateau silt covers a layer of chalky frost-affected silt, which overlies the chalk.

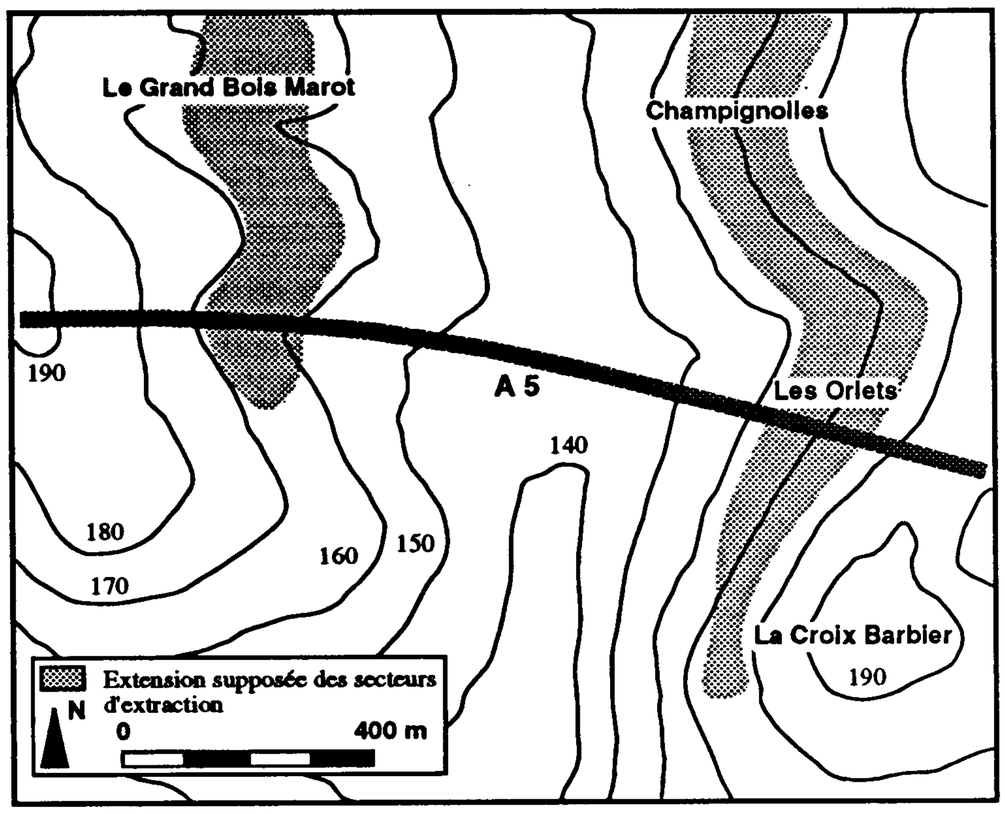


Fig. 1. Map showing the location of the two mines at Villemaur-sur-Vanne.

The exploited flint does not lie within distinct layers. On the other hand, a large number of nodules are to be found in the weathered chalky silt. This certainly results from the strong weathering of one or more flint-layers by frost. It seems that these blocks were the ones which were used.

The site was the subject of an excavation campaign during the winter of 1990/91. The work of both machines and archaeologists was made particularly hard by bad meteorological conditions and the very clayey nature of the deposits.

While the entire threatened area should have been stripped off, we only managed to prospect 3300 m². After mapping the site, we dug a 5 metres wide trench along the site (Fig. 2). Cross-sections of each extraction structure as well as a general cross-section of the trench were drawn.

At the same time, two debitage concentrations, one of which covered more than 35 m², were excavated, drawn and lastly taken off 25 by 25 cm to be studied. It had also been planned to excavate some remaining sections of shafts which trenches had revealed. The lack of time only allowed the excavation of two shafts.

The extraction site might cover a 15 ha area spreading over 1 km along the hillside. Eighty mining structures were brought to light over the stripped area (Fig. 3).

Flint mining was carried out in different ways. At the bottom of the slope, where the plateau silt layers tend to get thinner, extraction took place from 4 m long pits. Most of the mining activity took place however from shafts with underground side workings. The depth of many shafts is far greater than the level exploited. These quite particular morphologies could square with a mining technique adapted to the local situation. Indeed, as the flint is very unevenly distributed, miners first sank cylindrical trial shafts so as to estimate the quantities, the quality and the distibution of raw materials. The mining itself could only take place after these prior borings. As the bottom of these borings often lie below the exploitable levels, it was then used as

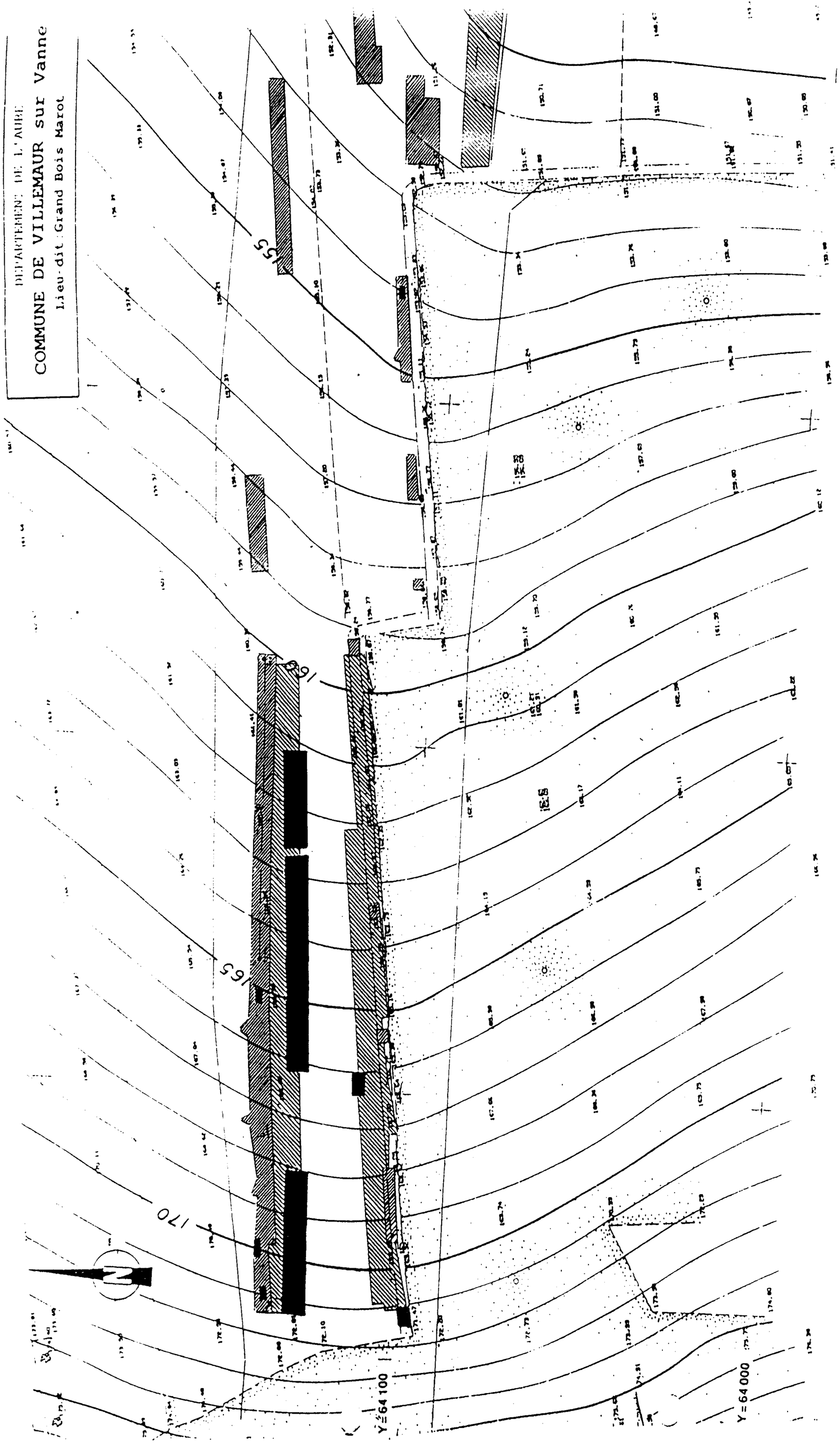


Fig. 2. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Plan of the site with the different phases of excavation.

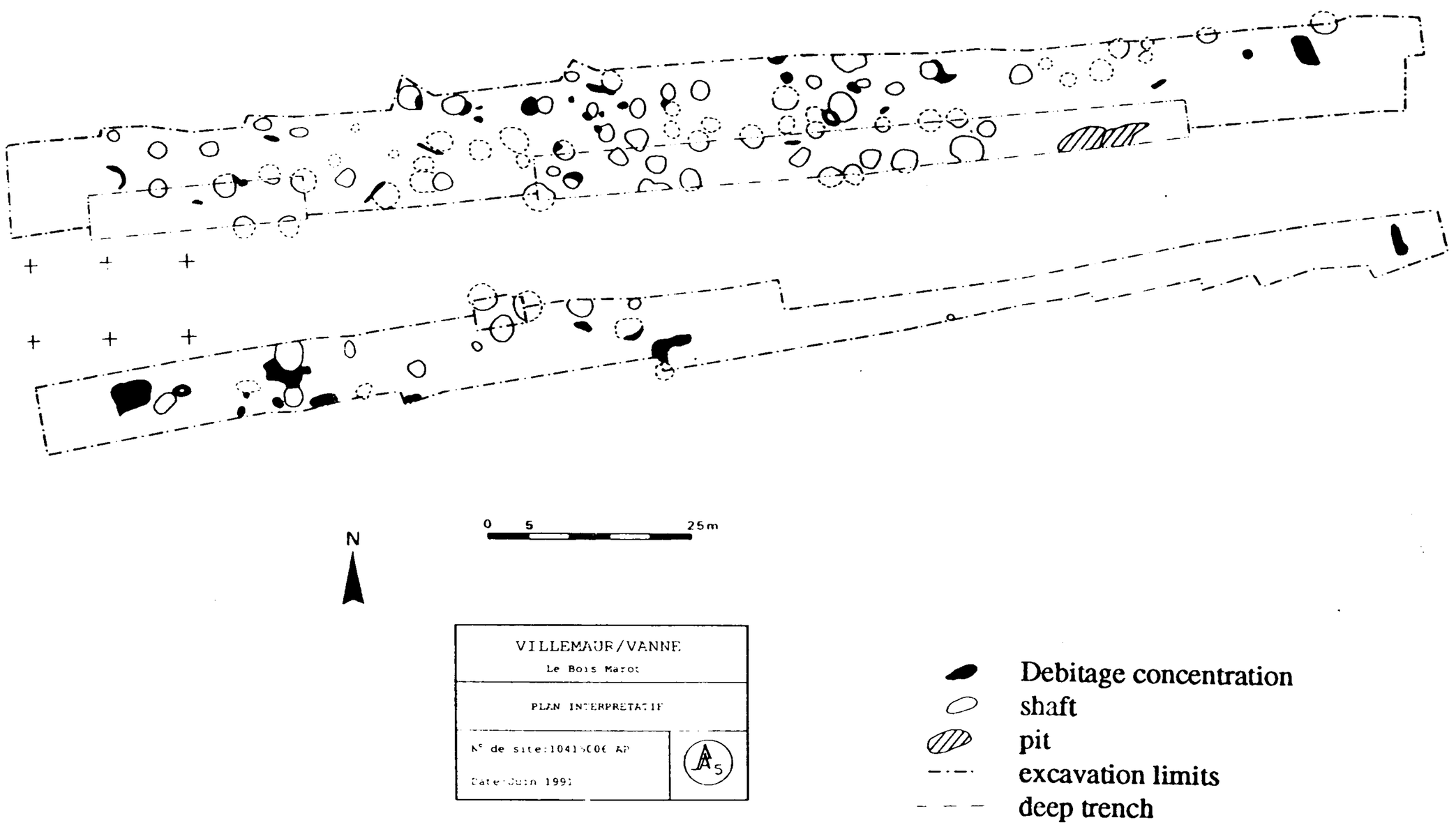


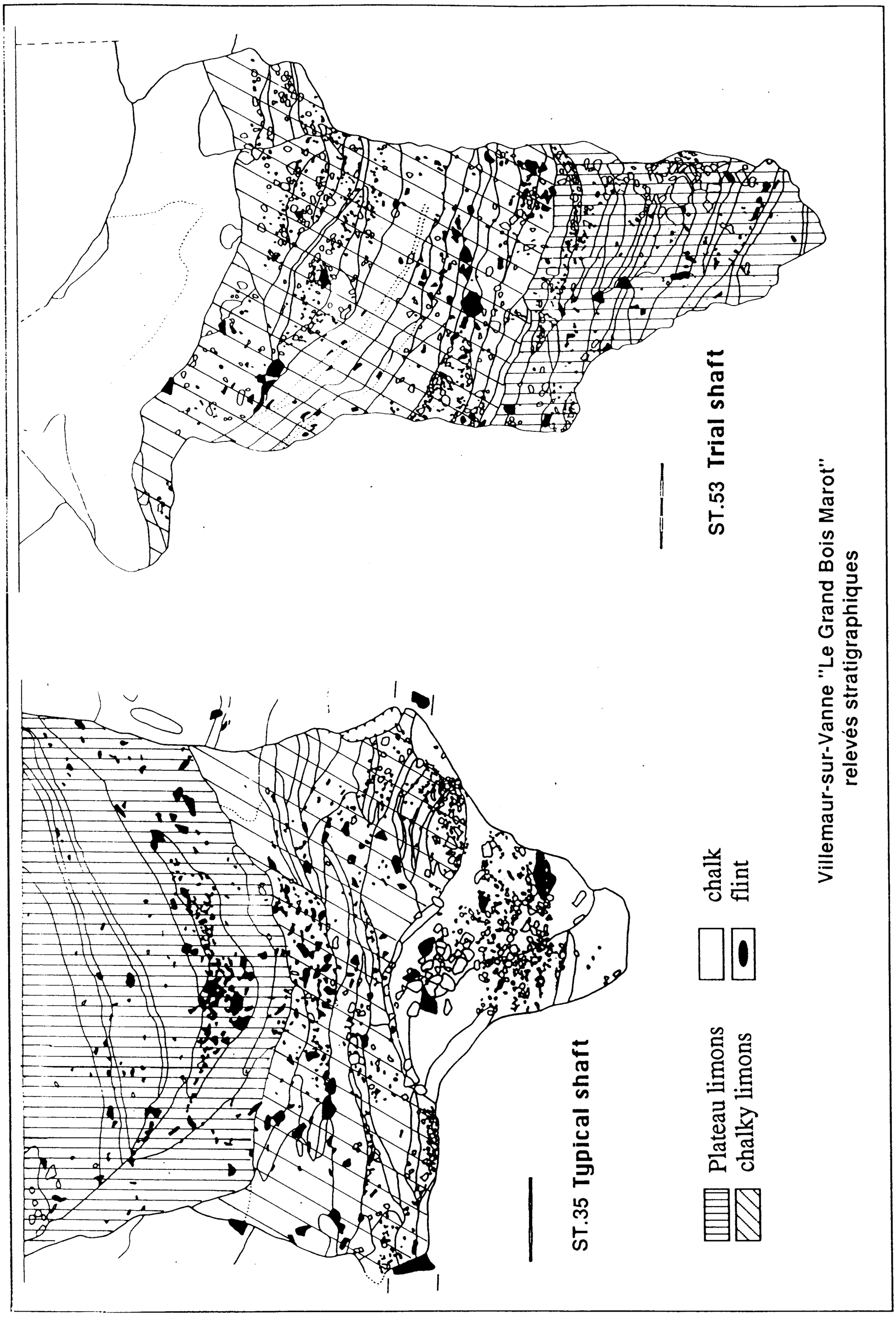
Fig. 3. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Plan of the site.

a dumping place for the rubble (Fig. 4). In most cases sediments only moved very little inside the shafts. As the nature of the sediments of the fill is generally the same as that of the enclosing substratum, vertical movements seem to have been minimal. The layers used for the filling of the shafts generally follows the same sequence as the substratum, *i.e.*, from the bottom to the top (of the shafts): layers consisting mainly of chalk in different forms, slightly or not altered at all by other sediments. The beige chalky silt above dominate in both the substratum and the shaft. As a result of a natural filling process, the upper parts of the shafts have layers which are more mixed.

Numerous flakes coming from the neighbouring workshops are often found in the layers that have filled in the funnel-like entrance of the shafts. In the le Grand Bois Marot mine, more than forty flake concentrations were counted within the stripped area (Fig. 3). In some areas, they could reach several tens of metres square and contained thousands of artefacts.

Manufacturing flint axes characterized the Le Grand Bois Marot lithic industry. This identification followed from the observation of knapping waste in chipping floors (flakes issued from bifacial shaping) and from the abundance of axe rough-outs collected during prospections (Dijon and Voisin collections) and during excavation.

The purpose of the study of the chipping floors composition was to determine if all the shaping stages were represented in the very rich flint waste of the chipping floors. This aspect seems fundamental: the study of the location of labour stages is



Villemaur-sur-Vanne "Le Grand Bois Marot"
relevés stratigraphiques

Fig. 4. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Simplified cross-sections of two different type of shafts.

linked to the question of spatial organization of production. The problem is to interpret results in socio-economic terms: was there a spatial division of labour and how was it integrated into the socio-economical structure of the mining production (Lech, 1981, 1982; de Grooth 1991)? Were miners also knappers? Was there a labour specialization?

A direct analytic method was adopted to study the abundant lithic artefacts from Villemaur. A recording form was therefore designed and divided into several flake categories relative to the axe manufacturing stages:

— roughing-out of the nodules: thick or very thick flakes, with cortex or partially covered with cortex; the hammer used was a hard one;
— shaping of the axes: thick flakes, some partially with cortex and without cortex or with cortex at the distal part; the hammer used was a hard then a soft one;
— finishing of the axes: thin flakes without cortex or with cortex at the distal part; the hammer used was a soft one.

Other categories were "nodules", "axe roughouts", "retouched pieces", *etc*. The data were recorded by the weight of the different flake categories. This method is faster and as significant as counting. A total of 800 kg of artefacts was sorted and weighed. They came from 4 different chipping floors of which composition was relatively close:

— the roughing-out stage was represented by 25% to 38.5% of the total weight of artefacts;
— the shaping stage, with little variations, by 20% to 35% of the total weight of artefacts;
— the finishing stage was homogeneous with 4% to 7% of the total weight of artefacts.

The composition of shaping flakes was similar to results of the experimental knapping by J. Pelegrin with six nodules obtained from the flint outcrops of Villemaur. The comparison with experimental data indicated that the empiric categories were valid and that the production sequence was completely achieved on the extraction site. The axe manufacturing was probably undertaken on the extraction site, at least on the four chipping floors studied. The discovery during sorting of flakes created by edge finishing seemed to corroborate this observation.

The relative proportion of technical categories was close between all chipping floors but the total weight of each of those was different. Independently of differential erosion, the volume of flint waste of each chipping floor could correspond to a different number of manufactured axes. An estimation of the number of manufactured axes for each chipping floor was made, using experimental knapping results. The length of labour was also calculated.

	Total weight of knapping wastes	Number of discarded axe rough-outs	Estimation of the number of producted axes		Estimation of the lenght of labour (hours)	
			minimal	maximal	minimal	maximal
Chipping floor 1	56708 gr	5	9	28	*5,3*	*16*
Chipping floor 40	44030 gr	0	10	26	*6*	*15*
Chipping floor 65	59372 gr	15	0	20		*12*
Chipping floor 36	354215 gr	35	51	172	*30*	*100*

Fig. 5. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Estimation of the number of axe rough-outs and of the length of labour according to the volume of the chipping floors (comparison with experimental knapping).

The results indicated an estimation from nine axe roughouts producted for chipping floor 1 to 172 for chipping floor 36 (Fig. 5). Considering the number of roughouts discarded on the chipping floors, an estimation of the number of products taken away was made. For chipping floor 65, only the half of the axe roughouts was removed. The rate of production was larger for chipping floors 1 and 36: from 64% to 83% of the roughouts were considered as good products and carried away. However, the rate of defective pieces seemed high, compared with the production of an experienced knapper like Pelegrin.

These observations could show that the knappers of Villemaur were occasional, and maybe non-specialist, axe makers. The study of reasons for discarding of the roughouts reinforced these hypothesis. More than the half of the roughouts were discarded for technical awkwardness which could have been avoided by a good knapper: hinged flake negatives rendering the piece unsuitable for further shaping, choice of raw material with faults, breakage caused by bad holding of the roughout during the manufacturing stage.

Three main production sequences characterized the manufacturing of most of the axe roughouts at the shaping and finishing stage:

— shaping of one of the surfaces by the two sides then turning the piece and additional shaping of the other surface; this sequence gives an asymmetric section;
— shaping by alternate flakes of one of the surfaces by one side and of the other by the opposed side; turning the piece and additional shaping; this sequence gives a symmetric section;
— shaping of both surfaces by one side then additional shaping by the other side.

The butts of the thin flakes without cortex or with cortex at the distal part, relative to the finishing stage, were observed for this study. The finishing stage consists in preparing the pieces for polishing and, at this moment, the knapper must posess a high degree of know-how. The finishing waste can give significant results concerning the level of knapping techniques.

Three butt categories relative to different degrees of preparation were determined:

— cortex butts: this category was probably fitted with accidental flakes during roughing-out stage with the hard hammer;
— prepared butts;
— unprepared butts.

Unprepared butts were the most numerous (73.8–79.4% of the butts) and prepared butts represented no more than 16% of the artefacts. The rates were inverse among experimental flakes. The knapper had chosen to prepare carefully the sides of the piece before flaking and the percentage of unprepared butts was lower (only 30.2% of unprepared butts, Fig. 6).

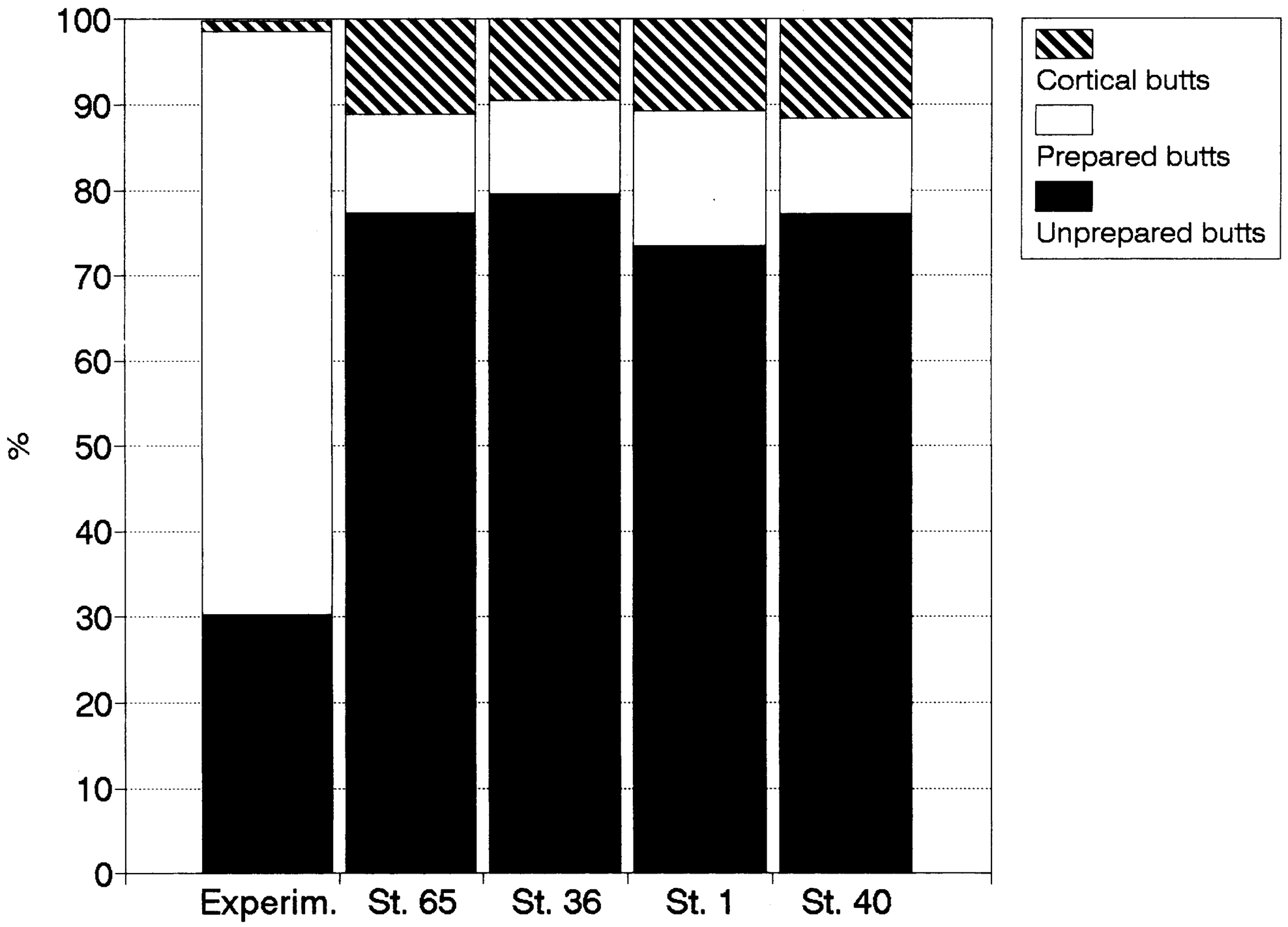


Fig. 6. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Types of butt among thin flakes related to finishing stage of axe shaping.

Comparison between archaeological and experimental productions allows us to study archaeological data with regard to a standard. It shows that the processing preparation of the side of the roughouts before flaking was very little, among the observed series at least. The high degree of wear of red deer antler hammers corroborated this remark.

Finished or semi-finished products found during the excavation were rare. Only one (burnt) polished axe was discovered in chipping floor l. Axes at the finishing stage and polished axes were however numerous in the surface collections from Villemaur

"Le Grand Bois Marot". But these pieces were not representative of real production since they are re-knapped or discarded during polishing. Nevertheless, available pieces can give some data about finished products (Fig. 7).

From the point of view of metric analysis, the dimensions of this little sample showed large variations. Short axes, longer axes, very thin axes and thick axes existed. But very few axes exceded 20 cm in length, in contrast to other mines productions in the Paris basin (*e.g.*, Jablines — Bostyn and Lanchon 1992). This characteristic could be related to raw material, the nodules of which are not very big (6 kg weight at most).

From the point of view of polishing, the few polished pieces coming from Dijon and Voisin's collections showed different degrees of polishing: in some, only the flake boundaries were smoothed, and when polishing covered a larger area it was located especially on the active edge. The pieces completely polished were reknapped on the edge and on one of the sides.

This first study of Villemaur lithic industry needs to be completed by additional investigations but it already allows us to get some ideas about the axe production process in Pays d'Othe.

From the point of view of production organization, the complete sequence of axe manufacturing, except polishing, could have been undertaken on the extraction site. At this stage of labour, there was probably no spatial division of labour and no workshops, out of the mine, specialized in different shaping stages, in contrast to other mines like Serbonnes and Bretteville-le-Rabet (Desloges 1986). These results could show that miners and axe makers belonged to the same domestic group. But this hypothesis needs to be verified by the exploration of other lines of research like geographic destination of finished products and places of polishing.

Together, the observations on technique and axe shaping process seem to indicate a minimal know-how on the part of the Villemaur axe makers. These results are however too partial to deduce non-specialization of axe production, but the high rate of rough-outs discarded because of awkwardness could indicate occasional knappers. Other explanations, not exclusive, can be proposed: a spatial explanation, with this kind of production related to this sector of the mine; an economical explanation, with an increase in the demand for axes at the end of the Neolithic reducing the length of apprenticeship (Roux and Pelegrin 1989). The study of evolution of the production methods in time and space could clarify these hypotheses.

The low standardization of the finished products must be verified by larger studies of pieces in utilization context. If this hypothesis is confirmed, the different size of axes could be related to functional differences, as is suggested by the Irian-Jaya ethnoarchaeological pattern (Pétrequin and Pétrequin 1990). Short axes could have been used for the exploitation of secondary forest, frequently mentioned for the final Neolithic (Pétrequin and Pétrequin 1988). The production of prestigious objects could also be proposed.

The red deer antler material consists of an important corpus: 215 artefacts were found during the partial excavation of 26 shafts and flint chipping floors (8 tools per

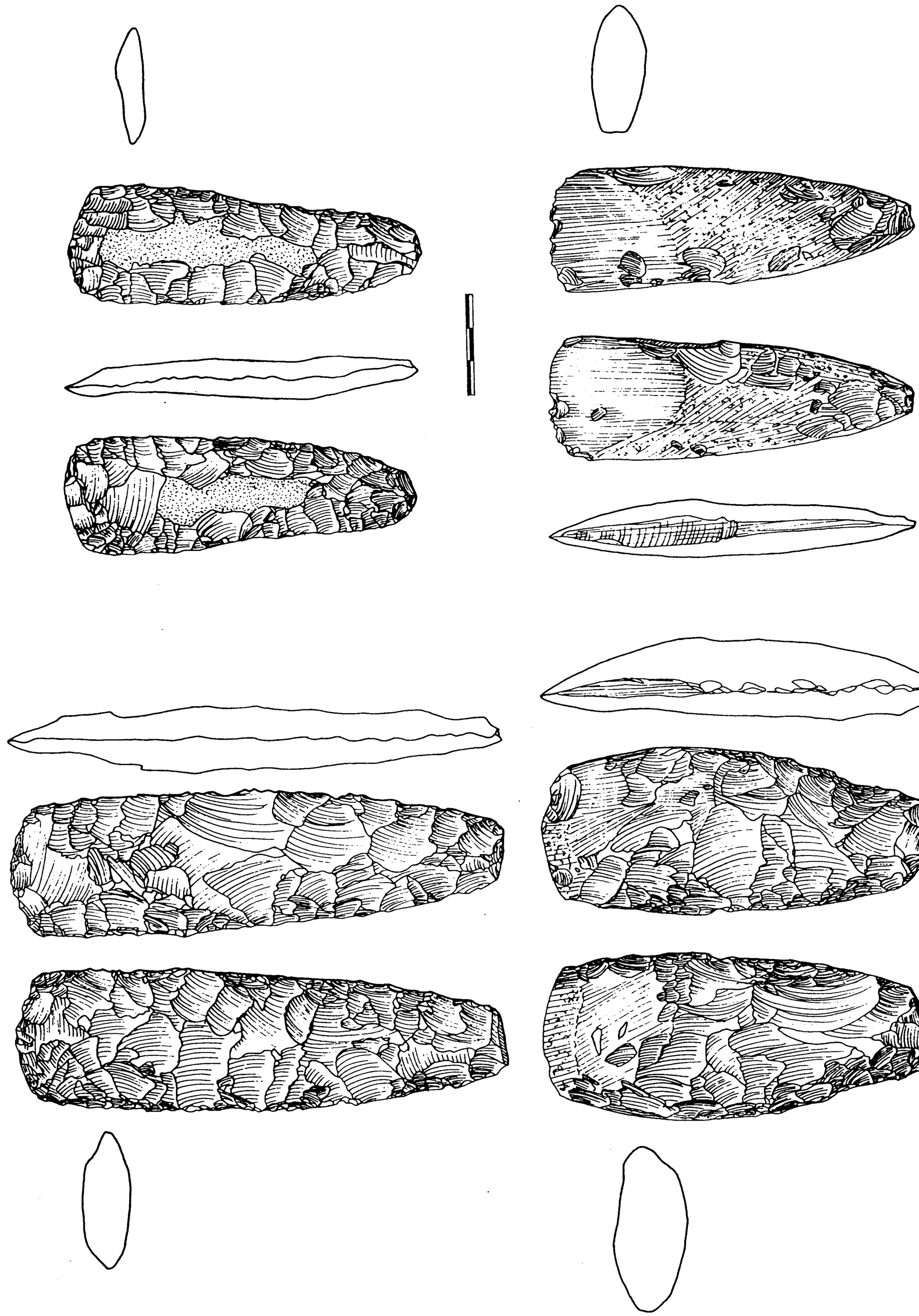


Fig. 7. F 54 Villemaur-sur-Vanne "Le Grand Bois Marot". Some finished or semi-finished products from surface collections.

structure on average; 25% of the objects were found in the chipping floors). There are 87 tools, 82 splinters chipped off in the course of work, 37 splinters and 9 elements from reduction sequences. Among the tools, 77 picks were used to dig the shafts; a retoucher and a square-sectioned lever can be compared with those found at Serbonnes. Two awls, one made of red deer antlers, the other of bone, are unusual material for an extraction site. We found 5 hammers, this is a high number. In opposition to that of Serbonnes, they were first shaped as hammers, then the tine that constituted their haft was cut off in order to be used as a pick.

The technology there is distinct from that in operation at Serbonnes. Picks are mainly made on tines (80%). The "husbandry" of the raw material is stricter. The tines, used for the achievement of mining tools, are complementary to those of settlements where they are seldom exploited. The tools are extremely deteriorated, completely worn-out. Among them, a high proportion were already shaped when brought to the site. Evidence of debitage is remarkably rare. Other characteristics: tines have standard lengths and are shorter than at Serbonnes (the average is of 113 mm against 154 mm at Serbonnes); 40% of them at least show modifications on their basis sometimes associated with traces of compression. Thus, tines must have been fitted into wooden handles. Debitage technique vary a lot and may include prior preparation such as soaking or steaming.

All this indicates that we are facing a technical system which is more developed than that of Serbonnes. It could be late or final Neolithic. Antler tools seem to be the main mining tools and the noticeable investment in their manufacture is also certainly the answer to a specific need perhaps related to the nature of the substratum.

Despite extended trial trenchings on either side of the mining area, we have not yet located any settlement.

As yet we do not have radiocarbon datation of the site, several features make us think, however, that this exploitation could date from a relatively recent phase of the Neolithic. On one hand the nature and the composition of the antler tools recall the industries of lacustrian sites. On the other hand, several notched scrapers were found. In this region, this type of tool only occurs in contexts dating from the recent or final Neolithic (3rd millennium BC), the S.O.M. or the Gord.

This site, as Pâlis "le Buisson Gendre" and Villemaur-sur-Vanne "les Orlets", is part of the mining complex of Pays d'Othe (Fig. 8).

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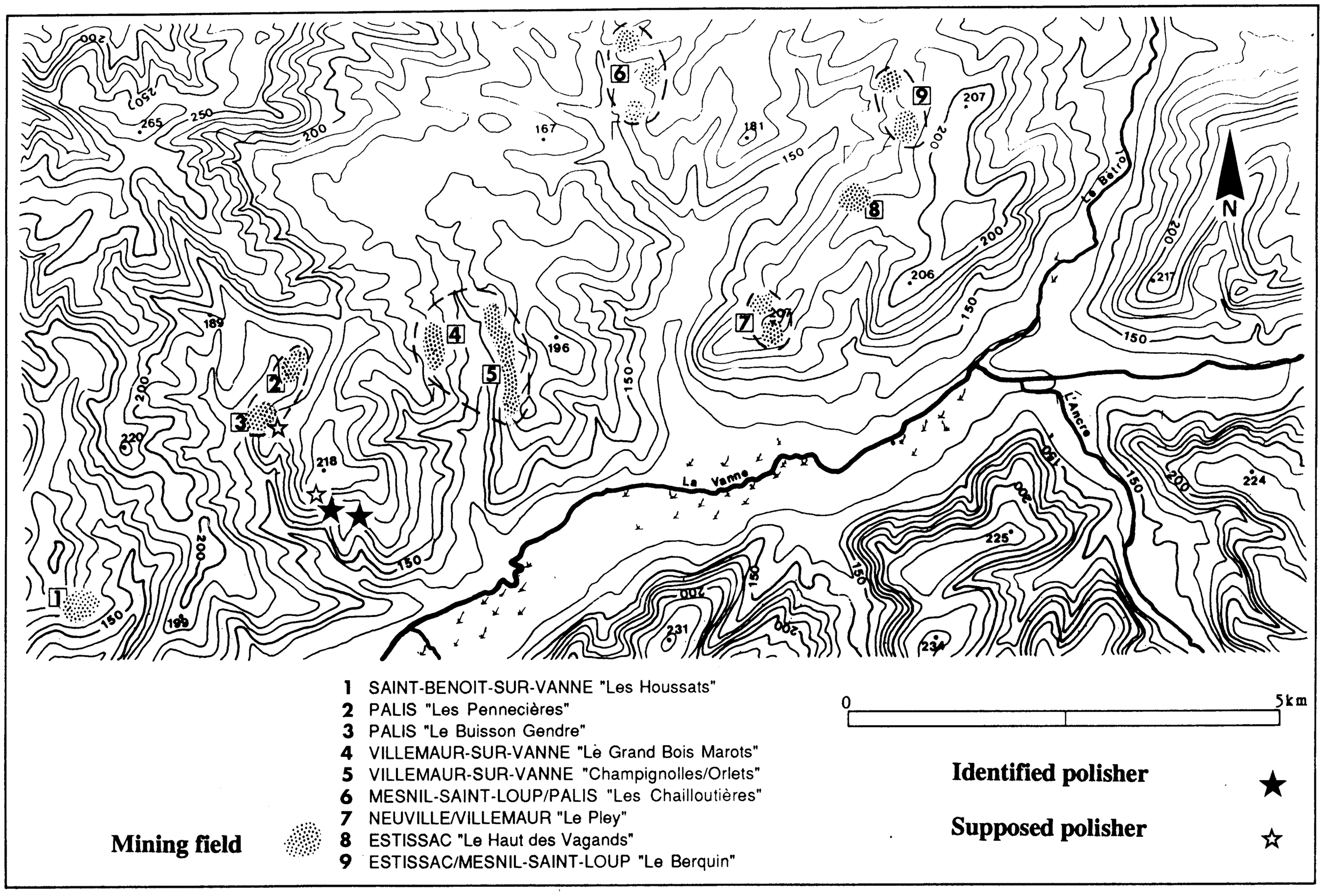

Fig. 8. Map of the Pays d'Othe mining complex.

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F 55 VILLEMAUR-SUR-VANNE, "LES ORLETS", AUBE DISTRICT

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The rural district of Villemaur is located some 40 kilometres east of Sens (Yonne) and 20 km west of Troyes (Aube) in a small region called "Pays d'Othe" (see catalogue entry F 52, fig. 1). The mine of Villemaur-sur Vanne "Les Orlets" (or "Champignolles") lies within the same dry valley as "Le Grand Bois Marot", but it is located on the opposite hillside (orientated to the west, see catalogue entry F 54, fig. 1). This site (like Plis "le Buisson Gendre" and Villemaur-sur-Vanne "le Grand Bois Marot" belongs to the Pays d'Othe mining complex — see catalogue entry F 54, fig. 8). The hillside slopes more than in the case of "Le Grand Bois Marot" and it is orientated to the west. The erosion was more severe than on the opposite hillside, thus, immediately under the thin layer of topsoil is the Coniacian chalk (C4–6H).