UNIVERSITY OF SOUTHAMPTON

FACULTY OF LAW, ARTS & SOCIAL SCIENCES

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Neanderthal archaeology in MIS 3 Western Europe: ecological and anthropological perspectives

by

Charalampos Garefalakis

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ABSTRACT

FACULTY OF LAW ARTS AND SOCIAL SCIENCES

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Doctor of Philosophy

NEANDERTHAL ARCHAEOLOGY IN MIS 3 WESTERN EUROPE: ECOLOGICAL AND ANTHROPOLOGICAL PERSPECTIVES.

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This thesis focuses on the occupation of selected regions in Western Europe by Neanderthals during the earlier part of Marine Isotope Stage 3 (MIS 3), namely the period between c. 60 and 40 kyr ago. It examines the archaeological evidence from three different areas, Britain, Belgium and South-Western France aiming to understand the occupation in these areas, both at a synchronic and at a diachronic level.

To achieve this, two models are employed. The first integrates archaeological data with climatic and environmental information; the second integrates archaeological data with ethnographic information from modern hunter-gatherers and modern social carnivores. Both models are applied to selected sites from each of the three regions. Each region is initially examined as a separate case study. The results for each site are discussed separately and then all the sites are brought together at the end of each case study. The collected information from all three regions is brought together at the end of the thesis and the collective results are discussed.

The evidence brought together with this approach suggests a possible movement of Neanderthals between the three regions, in response to climatic and environmental change in MIS 3. It also suggests a degree of variability in Neanderthals’ approach to their landscape that is difficult to fit within a rigid classification scheme.

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DECLARATION OF AUTHORSHIP

I, Charalampos Garefalakis declare that the thesis entitled "Neanderthal archaeology in MIS 3 Western Europe: ecological and anthropological perspectives" and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- none of this work has been published before submission

Signed:

Date: 25/01/2009

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For making most of the drawings included in this thesis and for assisting me with making the rest I would like to thank Aggeliki Zacharia. I would also like to thank Fotini Kofidou, Hanna Fluck, Karen Ruebens, Kerry Harris, Antonis Zervos, Lena Stefanou, Eleftheria Paliou and Yiannis Zindros, my friends and colleagues at the University of Southampton for all the interesting discussions we had and for making the PhD process more bearable.

Needless to say that the responsibility for the views expressed in this thesis, as well as for any errors and omissions is all mine.

Last but not least, I would like thank my partner Charis Zacharia, my parents Stelios and Popi Garefalakis and my sister Katerina Garefalakis. Their moral support throughout this process was invaluable.

CHAPTER 1: INTRODUCTION

This thesis focuses on the occupation of selected regions in Western Europe by Neanderthals during the earlier part of Marine Isotope Stage 3 (MIS 3), namely the period between c. 60 and 40 kyr ago. It examines the archaeological evidence from three different areas, Britain, Belgium and South-Western France and it has two main aims.

1. To understand the occupation in these areas at a diachronic level and in relation to each other.
2. To understand Neanderthal occupation at a synchronic level in each different area separately and then to bring this information together; this way a more holistic view of Neanderthal behaviour in Western Europe will be achieved.

So, the first aim will address issues of Neanderthal demography and population movement, while the second will deal with issues of mobility, land use and site function.

In order to achieve the first aim, a model will be built on the basis of the most recent global climatic and environmental data. This model will generate hypotheses in relation to the occupation of the three areas in different climatic episodes, within MIS 3 and will be tested on actual data from case studies from all three areas. The results will be discussed separately for each area and then brought together at the end of this thesis to provide a synthesis.

In order to achieve the second aim a separate model will be built on the basis of existing archaeological and ethnographic information. This model will provide an ecological/anthropological framework, within which Neanderthal behaviour will be understood. Archaeological information on Neanderthal subsistence strategies will be integrated with ethnographic information from modern hunter-gatherers and modern social carnivores to frame the Neanderthals' daily lives. Issues of Neanderthal group size, range size and duration of occupations will be addressed. In addition to this, a site typology for the classification of sites will be generated. For each of the sites the lithic assemblages will be either examined by the author, or if this is not possible due to time restrictions, the information will be obtained bibliographically. Due to this author's specialisation in lithic analysis, there will be an emphasis on the presentation of data from lithics, but wherever information from other datasets is available this will also be presented. In order to facilitate the presentation of these aspects of the lithics that are more relevant to this specific study, a simplified typology, devised by this author will be used. As in the case of the first model, the results will be discussed separately for each area and then brought together in a synthesis at the end of this thesis.

The structure of this thesis is the following: Chapter 2 is the methodology chapter and contains the two models in detail together with the problems that are associated with each model. It also contains the lithics typology that will be used by this author. Chapter 3 contains the presentation of the collected data from the area of Britain and their interpretation, according to the two models. Chapter 4 contains the collected data from Belgium and their interpretation, according to the two models. Chapter 5 contains the collected data from South-Western France and their interpretation, according to the two models. Finally, chapter 6 brings together the most important patterns identified in the case studies of the previous three chapters to form a discussion and draw the final conclusions of this thesis.

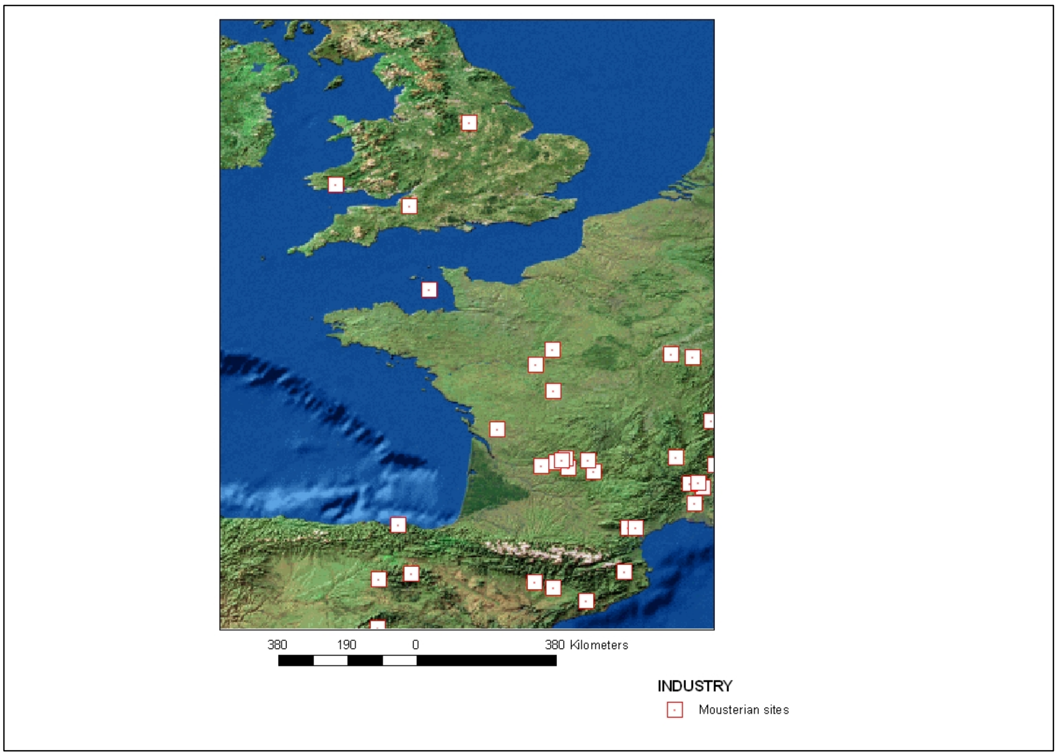


Figure 1: GIS map with the distribution of Middle Palaaeolithic sites in MIS 3 Western Europe, according to the Stage 3 Project C14 database (Made on ArcMap 9).

CHAPTER 2: UNDERSTANDING NEANDERTHAL BEHAVIOUR

2.1. Climatic and environmental change in the MIS 3 time scale: Contextualising Neanderthal behaviour.

2.1.1. Introduction

The developments in the studies of Quaternary climate during the past three decades have provided a better resolution for analysing and understanding the climate of specific time slices in the Palaeolithic. There have been two main types of development. One is connected with ice cores, located in Greenland (Shackleton, 1987, Grootes et al., 1993, Johnsen et al., 2001); the other is related to deep sea cores from various latitudes (Wastegård et al., 2006, Siani et al., 2004, Cayre et al., 1999). A synthesis has been achieved through the comparison of these two records (Schirmer, 2000), but also through the comparison with other sets of data from mammalian biostratigraphy, (Currant and Jacobi, 2001), pollen sequences (Guiot et al., 1989, Roucoux et al., 2001, Sànchez-Goñi et al., 2002) and fossil insects (Coope, 2002). Recently a great amount of the above mentioned data was collected and re-interpreted collectively in the Stage 3 Project of the University of Cambridge (Van Andel and Davies, 2003). Information from all these different proxies will be used in this thesis, when available, with the purpose to achieve the best possible synthesis.

The ice core records work on the basis of identifying in different parts of the ice stratigraphy the ratio between the oxygen isotopes ^{18}O and ^{16}O (Shackleton, 1987). These isotopes show the relative ratio between water and ice for a specific period. High values of ^{18}O proportion mean cold periods, while low values indicate warm periods. These ratios are connected to an ice-core chronology, which derives from counting annual layer increments of ice for the past 15,000 years. For the period before this, ice-flow modelling is used to reconstruct the chronology (Walker, 2005). Marine cores work on the basis of identifying the oxygen isotopes mentioned above in the foraminifera trapped in deep sea marine sediments (Burroughs, 2005). Both ice and marine cores provide us with detailed climatic sequences, but the possibility of errors in these sequences increases the further we go back in time.

The other methods, mentioned above, are based on the identification of plants, animals and insects for which we know their climatic associations from modern analogues. This of course entails dangers, since there is a possibility that Quaternary environments were not direct analogues for the modern associations used (Stewart, 2005). Given that all the available methods have their own disadvantages it is imperative that they are always used in combination with each other. This way we can get a more balanced reconstruction of ancient climates and environments.

The main problem posed in the combined use of these methods is the different scale of resolution. Marine cores have a chronological resolution ranging from several hundred years to a thousand years, while the ice cores provide an even greater one of 20-50 years. On the other hand, evidence from pollen, fossil mammals and insects refer to much longer periods, often tens of thousands of years. In this sense we should always expect that the results from these latter methods will be averaged, making difficult reconstructions on a small time scale.

In summary, we are now much closer to understanding Quaternary environments than we were 30 years ago. However, we are still far from having a perfectly clear view of the exact climatic conditions that prevailed during separate and well defined parts of the Palaeolithic. This is partly due to non-compatibility or contradictions between different sets of data. With this in mind I will proceed to describe the MIS 3 climate, after a short discussion of the problems posed by today's dating methods.

2.1.2. Dating methods and problems.

The most common method of relative dating used in the Palaeolithic is related to the classification of lithic assemblages in various cultural groups. There are three basic wide divisions, the Lower, the Middle and the Upper Palaeolithic, whose beginning and end varies in different areas of the world. Smaller subdivisions within these larger groups exist, also dependent on the geographical context that these assemblages are found in. In general, this is a coarse method for dating in the Palaeolithic and the boundaries between these periods are often debated. Middle Palaeolithic in Western Europe is usually thought to begin around MIS 7 (c.250 kyr ago) and to end in the middle of MIS 3 (c. 40 kyr ago).

Dating at a finer scale is provided by the methods of absolute chronology. Radiocarbon dating is one of the most common methods used in Quaternary research. It was developed in the 50's by the American chemistry professor Willard Libby (Walker, 2005 p.17). Radiocarbon dating is based on the calculation of the different carbon isotopes in formerly living organisms. There are three carbon isotopes that organisms absorb from the atmosphere, ^{14}C, ^{12}C and ^{13}C. The latter two are stable isotopes, which retain the same values after the death of an organism. However, ^{14}C tends to decrease in proportion with the passage of time (Walker, ibid, p.18). The radiocarbon dating method is based on the calculation of the rate of decrease in ^{14}C, in organic materials. The half-life of a ^{14}C atom has been calculated to be 5,730 years and under normal conditions up to eight half-lives can be measured. This means that radiocarbon dating can give an upper age limit of 45,000 years. Samples in the range of 45,000 are considered to be possibly older and these dates are termed infinite. Recent work in laboratories in USA and Western Europe have made possible that finite dates can be obtained with radiocarbon method, used on bone, in the area of 50,000 to 60,000 years.

Still, dates obtained with the radiocarbon method, can be questioned due to inherent problems of the method. Apart from the possibility of ancient or modern contamination of the samples, the most important problem is the long term variation in ^{14}C production in the earth's atmosphere. It has been shown that these variations can cause discrepancies between the ^{14}C age and the actual calendrical age of a dated sample. This was proved, using dendrochronology, an accurate method of date calibration, as far as the Holocene is concerned (Renfrew, 1973). The main outcome of this variation in ^{14}C production is the presence of "plateaux" in the ^{14}C timescale. This means that during specific periods, when the atmospheric ^{14}C emissions were reduced, samples of a different date appear to have the same ^{14}C age. This type of problem occurs to a great extent in the period between 30,000 and 50,000 years ago, making chronological associations difficult. In the recent years there has been a lot of discussion regarding the possibilities of extending calibration curves back in time. According to Reimer *et al.* (2004) calibration of the ^{14}C timescale to a calendrical timescale with a relative confidence can only be extended to 26,000 years $_{BP}$ (Reimer et al., 2004), but even in this case, after 15, 585 years $_{BP}$ there is a serious decrease in confidence (Walker, 2005).

In 2004, Hughen *et al.* generated a record for long term atmospheric radiocarbon activity extending back to 50,000 years ago, based on correlation of ^{14}C dates on marine sediments from the Cariaco basin, Venezuela, and the annual layer timescale of the Greenland ice core GISP 2. Climatic data and independent radiometric dating of events linked to the GISP 2 climatic curve were taken into account. The results showed a prominent ^{14}C plateau at 33,000 years ago, and the fact that in the period between 42,000 and 40,000 years ago 7,000 radiocarbon years elapsed in a period of only 2,000 calendrical years (Hughen et al., 2004). This ^{14}C correction curve provided a comparison method for the radiocarbon dates of the period after 40,000 years ago. More recent work on the NGRIP ice core though suggested that the GISP2 timescale had non-linear errors, meaning that not only were the absolute dates wrong but that rates of climatic change estimated from that timescale might have been in error too (Bronk Ramsey et al., 2006).

An attempt to produce a more reliable calibration curve for the period before 40,000 years ago was made more recently (Weninger and Jöris, 2008). They used a reliable climatic record obtained from speleothems of the Hulu cave in China (Wang et al., 2001). U/Th dates from this record were transferred to the ice cores to produce a new absolute age calibration for the GRIP and GISP2 cores. The results of this calibration are independently supported by the relative chronology of the NGRIP core. To provide additional control for this new Greenland/Hulu timescale, Weninger and Joris (*ibid*) used independently dated volcanic markers, which are well fixed within different oxygen isotope records. The two most important were the Campanian ignimbrite (De Vivo et al., 2001, Giaccio et al., 2006) and the North Atlantic Ash Zone II (Southon, 2004). In both cases the measured absolute dates were in agreement with the Greenland/Hulu timescale. A final touch to this calibration model was given by the utilization of a recent update of the Cariaco marine C^{14} age calibration, which has also been synchronised with the Hulu cave speleothems (Hughen et al., 2006). The combined use of all the above records resulted in a calibration curve for the last 60,000 years, the CalPal2007$_{HULU}$. This calibration method can be entirely referenced to U/Th dates. It combines a recently compiled U/Th coral database (Fairbanks et al., 2005), the Hulu-tuned radiocarbon data from Cariaco (Hughen *et al.*, 2006), and C^{14} data from the Greenland/Hulu-tuned marine cores MD952042 (off the south-west coast of Iberia) and PS2644 (in the North Atlantic ocean). This calibration method for the past 60,000 years should not be considered to be the last word on this issue. It is expected that in a few years new developments in dating methods and new data sets will produce even more refined and reliable methods of calibration for this period. Given though that it is the only one we have in our hands at the moment for the period examined in this thesis (60-40 kyr ago), it will be used, when possible, to calibrate C^{14} dates, with the help of the CalPal_A software (www.CalPal.de.)

Another category of dating methods for the Quaternary consists of the Thermoluminescence (TL), the Optically Stimulated Luminescence (OSL), and the Electron Spin Resonance (ESR) methods. These are known collectively as radiation exposure methods. These methods work by freeing and counting electrons that have been trapped in structural defects of crystal lattices following the exposure to radiation. They are applied usually on sediments, but also on stones like quartz and burnt flint, and they all work on the same principal. The larger the number of trapped electrons, the longer has been the exposure of the material to radiation, and hence the greater its age (Walker, 2005, p.95-96). The time scale is produced on the basis of how much time has elapsed since the most recent firing event or exposure to light of these materials. Again, like in the case of radiocarbon, errors can occur due to recent or ancient contamination of samples. Also problems can occur when a residual TL component in the sample is not identified and taken into account. In this case this is added to the TL signal produced by the method, resulting in distortions of the dating process. In general though these techniques, when performed cautiously, can be considered much safer than the radiocarbon method and especially for the period before 30,000 years $_{BP.}$ Unfortunately these techniques are relatively recent and have not been applied to many Palaeolithic sites as yet. As a result chronologies have to be built on combinations of radiation exposure and radiocarbon dates. Calibration of the latter, on the basis of the former, is not easy due to the relatively large margins of error in all methods, sometimes even reaching 5,000 years.

Unfortunately, most of the time absolute dates, calibrated or not, are not enough. One of the most common problems, in Late Neanderthal sites in Western Europe, is that there are archaeological deposits, for which there is only averaged dating. This is, at best, produced by dating bones in different depths of archaeological deposits, or even by a single date at a specific level of a deposit. Unfortunately, the dates are not always directly associated with the archaeology and cannot date it in a precise way.

I believe that a possible way to overcome this problem is to try and tie Neanderthal presence to specific climatic episodes. It is possible, using the most recent climatic data from ice cores in conjunction with the other climatic proxies mentioned in the previous section, to infer in which periods it is more likely for Neanderthals to be present in specific areas. The limits of the periods that will be under scrutiny will be framed by published TL, or corrected ^{14}C dates, from the deposits investigated. The C^{14} dates will be calibrated with the $CalPal2007_{HULU}$ curve. For this reason, it is imperative to use the NGRIP climatic curve for reference, since these two are the most compatible chronologically.

What I will propose is a heuristic model with the purpose of generating working hypotheses that have the potential to be falsified in the course of the development of the field of absolute dating. In this sense what is investigated here is the potential for Neanderthal settlement in Western Europe in specific time slices, within MIS 3. In order to achieve this, general trends in Neanderthal behaviour will be taken into account. More specifically, their possible climatic tolerances will be considered, in order to propose Neanderthal movement between areas, according to climatic change. My main aim is to investigate aspects of Neanderthals’ behavioural ecology in three different areas of Western Europe, namely Britain, Belgium and South-Western France. This method will be presented in detail in the next sections.

2.1.3 Using the NGRIP climatic curve: highlighting potential problems

Marine Isotope Stage 3 is the period between roughly 60,000 and 25,000 according to the ice core chronology. It is known nowadays that the Last Glaciation (correlated to the Devensian stage in Britain, and the Weichselian in mainland Europe), is characterised by a series of high frequency climatic oscillations, known as Dansgaard/Oeschger (D/O) events (Dansgaard et al., 1993). These events occurring on a millennial basis caused high degree changes in temperature and humidity, probably affecting the environment, including hominids and other faunal elements.

These oscillations are best represented in the climatic curves of the ice cores and the marine cores. In the model that will be outlined below, data from the NGRIP core, located in Greenland, will be used to signify these climatic changes. Of course, the fact that climatic proxies from an area so far away from Europe are used could not come without any issues. There are two main problems:

1) Although these curves provide a proxy for trends in global climatic change fluctuations, they do not represent the temperature and humidity values which prevailed in all areas. The values outlined in these curves refer to the specific localities where these measurements are taken. This means that other sets of data collected in Western Europe need to be used in conjunction with the global climatic signal, for more realistic estimations of temperature and humidity.

2) The variable effect these global climatic trends would have had on the environment in different areas of the planet. For the area of Western Europe that is the focus of this thesis we know from the Stage 3 Project, that different habitats often had different responses to the same climatic changes. These variations will be examined in more detail in the next section. Suffice to say here that it is important to use environmental proxies from each specific region examined, in order to decipher the meaning of global climatic change for each one of them.

To highlight the first issue, I will provide a comparison between temperatures recorded in an ice core and inferred temperatures for an area of Europe inhabited by Neanderthals, during the same time frame. Given that there is no available data at the moment on the actual temperatures represented by the oxygen isotope values in the NGRIP curves, I will use the temperatures recorded in the Vostok ice core, in the Antarctica as an example (Petit et al., 1999).

Figure 2 is a graph showing the climatic curve for the Vostok ice core (red line), in the period between 60 and 40 kyr ago, and the actual temperatures it represents (blue line and blue numbers). The temperatures range from -7 to -2. According to this graph, the higher temperatures recorded in the climatic ameliorations of the period do not exceed -2. However, another set of data for the same period but from a different area, shows a different picture. The example used here is based on coleopteran assemblages from Britain (Coope, 2002). Coleoptera, which are very reliable climatic indicators, point to much higher temperatures prevailing in Britain, during the climatic ameliorations of this period. The temperatures indicated reach as high as 17^0 C, during the warmest months.

The same conclusion is reached if we examine the mean temperatures recorded in a marine core, which is much nearer to Europe than Greenland. Figure 3 is a graph showing the climatic curve and the inferred temperatures recorded in the MD952042, a marine core drilled off the south-west coast of Iberia (Cayre *et al.,* 1999). The inferred temperatures are in the range between 12^o and 15^o C, which is much higher than the temperatures that would be recorded in any ice core.

In other words, the climatic curves deriving from ice cores can give us a rough idea of how the climate fluctuated globally but they cannot be translated in specific temperature or humidity values for areas that Neanderthals inhabited.

To highlight the second issue, I will attempt to test the level of response of the European environment to the climatic changes, recorded in the ice cores. The example that will be presented here (Figure 4) uses the percentage of tree pollen in one of the most detailed pollen cores of southern Europe, Lago di Monticchio, in Italy (Watts et al., 1996). The curve of the tree pollen (in blue) is compared with the evidence from climatic change as seen in the NGRIP core (in red). As we can see the rise of tree pollen percentages in general follows the rise of temperatures in Greenland, as we would expect if the climatic signal from Greenland was really a global indicator.

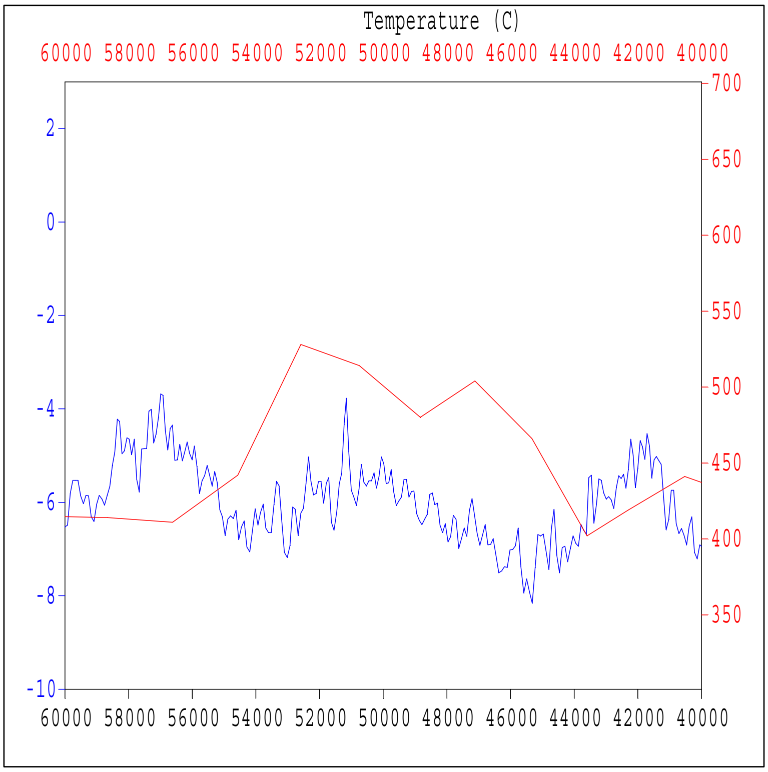


Figure 2: Climatic curve and range of temperatures recorded in the Vostok ice core, after Cayre *et al.*, 1999. Graph produced in CalPal_A.

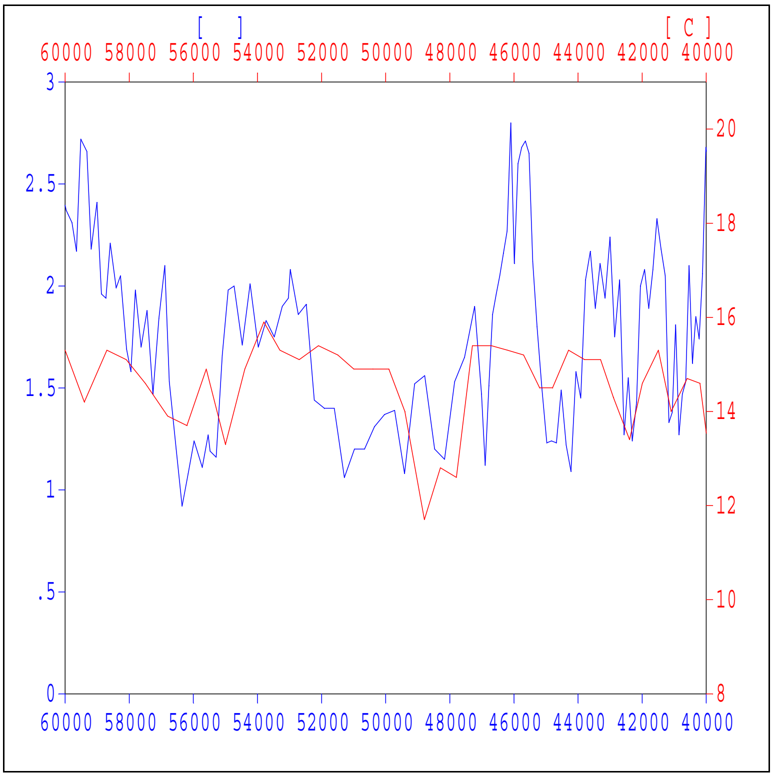


Figure 3: Climatic curve (in blue) and inferred temperatures (in red) from the MD952042 marine core of the south-west coast of Iberia.

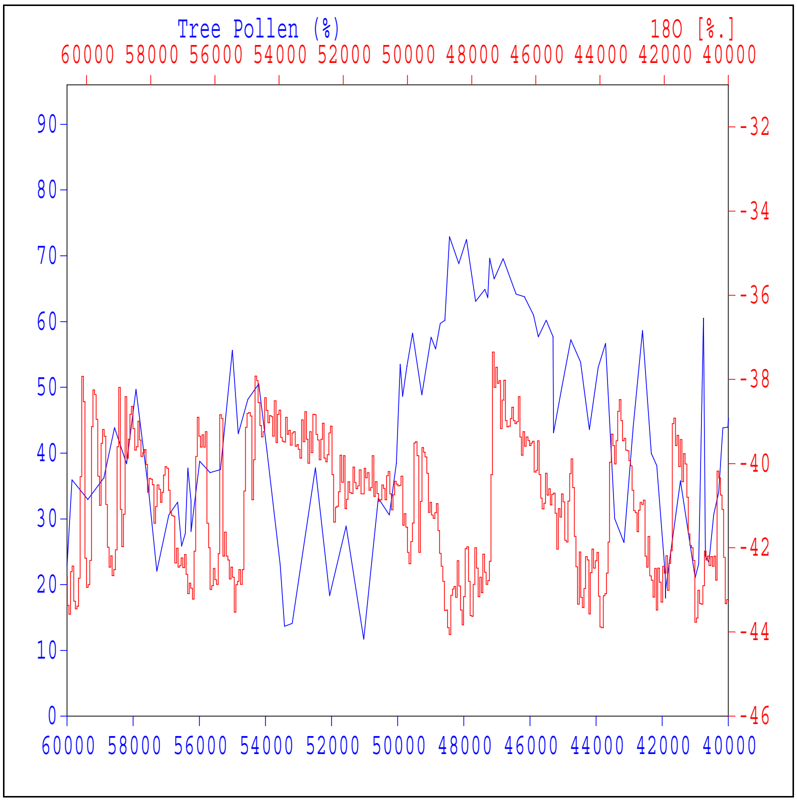


Figure 4: Comparison of the climatic curve of NGRIP (in red) and the percentage of trees in the Lago di Monticchio pollen core in Southern Italy (In blue).

On the other hand, the changes do not occur always with the same magnitude, nor at the exact same point in time in both records. This could be related to the differential response of tree populations in various periods, according to what conditions preceded each specific climatic amelioration and how easy it was for these populations to recover. Alternatively, it may be related with the coarser nature of the pollen record that does not preserve the level of detail seen in the ice cores. This type of discrepancy is likely to occur in the comparison of ice core curves and the pollen data from the specific sites that will be examined in the second part of this thesis. It will be dealt with separately in each case and an effort will be made for the two datasets to be combined in an as constructive a way as possible.

2.1.4. Neanderthal occupation in the context of the MIS 3 climatic change.

In this section I will attempt to place Neanderthal occupation in the context of climatic change as this is recorded in the NGRIP. Figure 5 shows the climatic changes that occurred between 60,000 and 40,000 years ago. This is the period that broadly covers the Late Middle Palaeolithic occupation of Northern Western Europe by Neanderthals. The oxygen isotope values, which are shown, range from c. -37 to c. -44 and reveal the real complexity of the climate during this period. On the one hand, we have oxygen isotope values similar to those witnessed in the Last Glacial Maximum (-44 to -41). On the other hand, values significantly higher (-41 to above -38), showing short climatic ameliorations, within the overall cold climate of the period. Walker (1997) mentions a pattern of rapid warming and slow cooling in the climatic record of MIS 3. This is true in the long term, but as we will see in part 2, when specific warm episodes will be examined in greater detail, this pattern does not necessarily hold true in the short term. Sometimes rapid warming is followed by rapid cooling.

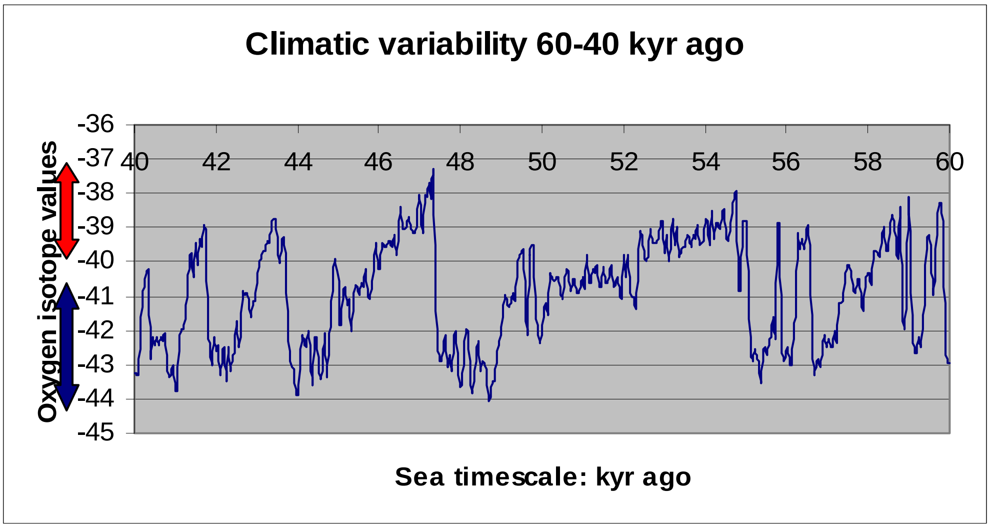


Figure 5: Graph showing climatic oscillations between 60 and 40 kyr ago. Low oxygen isotope values show cold climate. The blue arrow indicates values equivalent to the LGM. The red arrow indicates values, corresponding to mild intervals. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

In order to understand the effects of these temperature fluctuations on Neanderthal population movement, it is necessary first to consider the traditional view of Neanderthals, as a cold adapted species. This idea originally based on the "peculiarities" of Neanderthal anatomy, in comparison to that of modern humans, has recently been revised by different researchers. Aiello and Wheeler's study of Neanderthal thermoregulation (Aiello and Wheeler, 2003) showed that Neanderthals would only have had a minor advantage of 1^{o} C, in cold tolerance, if compared to modern humans. Stewart suggests that Neanderthals' short limbs, far from being associated with adaptations to arctic conditions, were mainly associated with Neanderthal ability to live in closed, as well as in open environments (Stewart, 2005). Short limbs would give an advantage in a more restricted forested environment. An alternative explanation is proposed by Bramble and Lieberman (2004), who relate the generally short stature of Neanderthals to the performance of a different type of running, in comparison to modern humans. Neanderthals are thought to have performed encounter hunting, where short distance sprinting would be required. In contrast the long stature of Modern Humans is connected with running long distances (Bramble and Lieberman, 2004). Another feature of Neanderthal anatomy, usually associated with cold adaptation, is their big nasal cavities. Contrary to this idea, it has been suggested that the actual role of the big nasal cavities was not to keep Neanderthals warm, but to help their body cool off from excessive activity (Schwartz et al., 1999).

If these new ideas are true and Neanderthals were not as cold adapted, as we thought, then it is possible that as a species they were seriously affected by climatic deteriorations in the same way that other elements of the "mammoth steppe" were. This means that during the downward turns of climate, during MIS 3, they would have to retreat from Northern territories to areas with more favourable conditions. Further evidence to support this view comes from the information about hominid occupation of Britain. Currant and Jacobi proposed an abandonment of Britain between early MIS 6 and the beginning of MIS 3 (Currant and Jacobi, 2001, Currant and Jacobi, 1997). This idea has been also supported in other papers (Ashton and Lewis, 2002). It is suggested that hominids abandoned Britain due to the harsh conditions of MIS 6, something that probably happened, during previous glacial periods as well. When the conditions became favourable again during the MIS 5e interglacial, the sea-level had risen too quickly, making Britain inaccessible. This is possibly the reason why Britain remained uninhabited, although we know now that Neanderthals lived nearby in the area of Northern France, during the same period (Antoine et al., 2006). During MIS 4, Britain is connected to the rest of Europe, with a land bridge, but no hominid occupation is recorded. Evidence for the presence of other animals, during this period is also sparse. MIS 4 is a period of very harsh climatic conditions.

Figure 6 shows the climatic curve for MIS 4, as indicated from the NGRIP core. The oxygen isotope values on which it is based are proxies for temperature and humidity. Two episodes of relative climatic amelioration (indicated with the red arrows) occurred, one just before 70 kyr ago and one between 65 and 64 kyr ago. Both episodes are short and the climate becomes only slightly milder, with oxygen isotope values in the area of -40. For the rest of this period the picture is pretty uniform. We are dealing with climatic conditions, similar, or even colder, than those of the Last Glacial Maximum, with oxygen isotope values, ranging from -42 to -45.

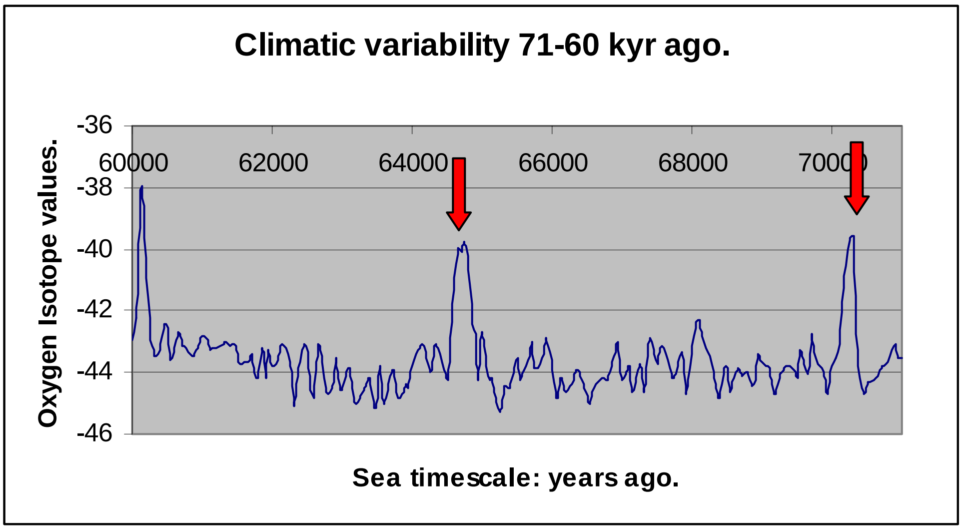


Figure 6: Graph showing climatic variability, during MIS 4 (c. 71-60 kyr ago). The red arrows indicate two periods of relative climatic amelioration. NGRIP data available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

We know that by MIS 4 Western Europe was inhabited by Neanderthal populations, believed to be adapted to very cold conditions. At least some sites of this period have been identified in Northern France (Locht et al., 1995). The open environments of Northern France could not have constituted refugia, where northern Neanderthal populations would retreat, during this period. The environment of the Late Middle Palaeolithic occupation in this area does not justify such a characterisation (Antoine, 1993). The characteristics of refugia related with terrain, plant and faunal diversity (Stewart *et al.*, 2003) are all missing. For this reason, it seems more plausible to me that at specific points, within MIS 4, Neanderthal populations reached Northern France from the south and briefly remained there. It is my view that if Neanderthals were really adapted to extreme cold, they would not have stayed away from Britain, given that there was no geographical barrier between Northern France and Southern Britain by that time. It seems that despite the two MIS 4 warming episodes, it was still too cold for Neanderthals to move northwards into Britain.

To better understand how Neanderthal retreat from Britain might have worked, during the equally cold phases of MIS 3, we have to come to terms with the idea of Pleistocene refugia. This term refers to areas, where the vegetation and fauna remained rich and diverse, preserving a milder local micro-climate, despite global climatic deteriorations (Stewart and Lister, 2001, Stewart et al., 2003). Taking into consideration the dominant view for abandonment of North Western Europe by hominids during the Last Glacial Maximum (LGM) in MIS 2 (Djindjan et al., 1999), we should consider that during the coldest parts of MIS 3, when conditions similar to the LGM prevailed, a possible retreat of Neanderthals to southern refugia could have occurred. South-Western France, an area of very rich biodiversity (Stewart *et al., ibid)* could have been one of these refugia. A mix of taxa from different environments and altitudes and the presence of interglacial survivors (Stewart *et al,* ibid), like straight tusked elephant, steppe rhino and Merck's rhino show persistence in temperatures and environmental associations, close to those of an interglacial. This validates the assumption that this area, in the overlap of the northern and Mediterranean zones, would have been the preferred refugium for northern populations in times of great climatic deterioration. The periods, when conditions similar to the LGM prevailed, will be termed the "extremely cold episodes".

In the beginnings of the periods of climatic deterioration, when conditions were not yet so harsh, northern refugia, like the area of Ardennes in Belgium could have been preferred. This area of Belgium is another example of an ecologically rich area, during MIS 3. The combination of mammoth steppe elements with forest taxa, like red deer, montane taxa like ibex and chamois and more temperate taxa like roe deer and wild boar would have given this area a unique character (Stewart et al., 2003). The same area would also be one of the first to be re-populated in the periods immediately after the "extremely cold episodes", when gradual warming occurred.

What is proposed here is a pattern of Neanderthal occupation in Western Europe during MIS 3, which consists of hominin movements from higher to lower latitudes and the opposite, according to climatic change. Those Neanderthal populations that would have retreated to the South-Western France refugium during the "extremely cold episodes" would gradually move to the northern territories again, reaching Belgium as the climate ameliorated. I would expect that Britain, being in the northernmost edge of this continuum, would only be occupied during the warmest peaks of these climatic ameliorations, after the Northern refugium of the Ardennes had been re-occupied. In the same way I would expect a gradual retreat of populations to the south as the climate deteriorated, starting with a retreat from Britain, going through the Ardennes refugium, and ending up with the complete abandonment of North Western Europe. In this sense Neanderthal occupations of Britain would always be preceded and followed by a significant aggregation of populations in the area of the Ardennes. I would expect this pattern to manifest itself, not only in the faunal remains from these regions, but also in the archaeological signatures, meaning greater density of sites in Belgium, in comparison with Britain.

In order to map these movements onto the NGRIP signal I have developed the following argument. I already mentioned above that the two warming events of MIS 4 were not warm enough to allow the re-population of Britain. Knowing the oxygen isotope signal from MIS 4 (Figure 6), we can infer a "higher than" limit in oxygen isotope values as the minimum condition for occupation in Britain. Since the highest oxygen isotope values that are reached during MIS 4, when Britain is abandoned, are in the area of -40, I would expect that it would take values >-40 to create the potential for re-population of Britain.

The most recent summaries of Neanderthal research in Belgium (Toussaint et al., 2001) indicate that this area was also abandoned during MIS 4. This indicates that even if the Belgium occupation could have preceded and followed the British occupation, this would have been restricted to the same limits of the >-40 climatic ameliorations.

In this sense, the cut-off point on the NGRIP climatic scale for any Neanderthal occupation in North-Western Europe would be taken to be the oxygen isotope -40 value. The area of Ardennes in Belgium would be one of the first to be occupied, thanks to its refugium character. Britain would probably only be occupied during the peaks of these warm intervals, and would be soon abandoned again with the beginnings of climate deterioration. From now on these climatic ameliorations will be called the “mild episodes”. It is possible that the proposed Neanderthal population movements were as rapid as the climate changes happening. This model is schematically presented in Figure 7.

The significance of this model is multiple.

1. It’s the first time that a model of population movement is used to tie these specific three regions together.
2. It’s the first time that the global climatic signature is used in such detail in a multiregional archaeological study.
3. The model has clear implications about expected archaeological signatures in different regions.

To explain this latter point further, Britain would have, in overall a very small occupation window, since it would have been occupied only during the peaks of the “mild episodes” of MIS 3. On the contrary areas with a refugium character should be expected to have had larger occupations, since they would have been occupied, for longer periods of time. In the case of the Belgian Ardennes this could be taken to mean the greatest part of the “mild episodes” , while in the case of South-Western France it would mean occupation at all times, and hence the largest occupation of all areas. In terms of the averaged record that we now have in our hands, this would mean the greater the occupation of an area, the more archaeological sites that should be found today and the more intense the occupation witnessed in archaeological layers.

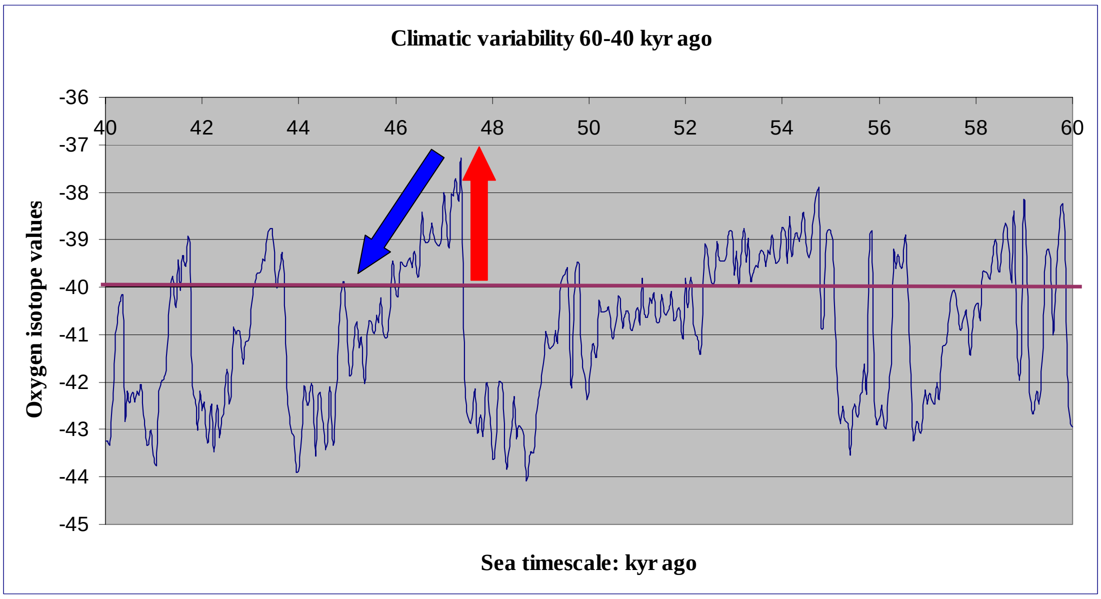


Figure 7: Schematic representation of my model for Western European Neanderthal MIS 3 population movements, in relation to climatic variability, as shown by the NGRIP data. The "mild episode" between 48 and 46 kyr ago is used as an example. The purple line indicates the cut-off point at which climatic conditions would start to favour Neanderthal occupation in North-Western Europe. The red arrow indicates the period of climatic amelioration, when Neanderthals would have moved north towards Britain, while the blue indicates the period of climatic deterioration, during which they would have retreated to the south. Data available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

In order to have a better understanding of the meaning of these cold and warm episodes, in terms of actual climatic attributes, I decided to use some of the climatic simulations produced by the Stage 3 Project (Barron et al., 2003). The simulations for the LGM will be used as indications of the climate that prevailed during the "extremely cold episodes" when Neanderthals would have found refuge in South-Western France, while the simulations for a "Warm stage 3 phase" will be used as indications of the conditions that prevailed, when North-Western Europe was re-populated.

In regard to the simulations of a "Warm Stage 3 phase", the authors state that these simulations correspond to the warm phases between c. 45 and 42 kyr ago. They also suggest that these can be taken to represent all warm Stage 3 episodes between c. 60 and 45 kyr ago. As seen in figure 8 though, the two "mild episodes" between c. 45 and 42 kyr ago are neither the warmer nor the longer climatic ameliorations within the period in question. For this reason, information from the "stage 3 warm" simulations will be used with caution. For the period before 45 kyr ago, these simulations can only be understood as underestimations of the climatic attributes of the ameliorations described. This is because the simulations were built to describe warm episodes of lower magnitude than the ones that predate 45 kyr ago.

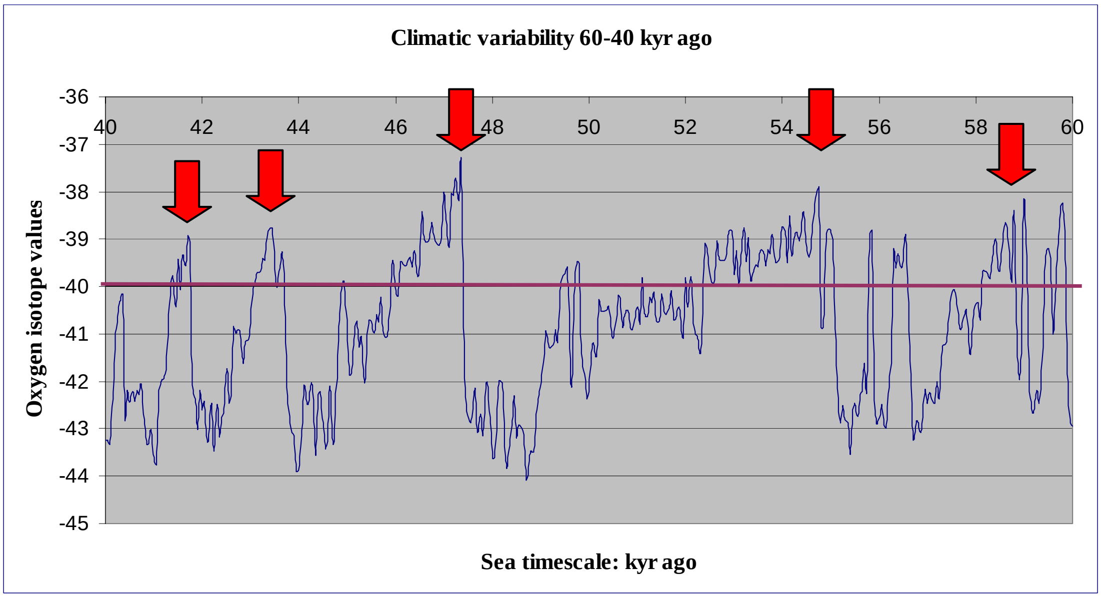


Figure 8: Climatic variability between 60,000 and 40,000 years ago. The purple line indicates the change to favourable conditions for Neanderthal occupation in North-Western Europe. The red arrows indicate various "mild episodes", within MIS 3. NGRIP data, available at: http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Below, I am presenting some of the maps produced by the stage 3 project computer simulations as an example of how these simulations can be used in the context of the research undertaken in this thesis. The results are relatively coarse grained and there is not very much detail in the level of individual sites, but general trends between regions can be outlined.

Figure 9 is a summer temperature simulation of the "Stage 3 warm phase". What is of interest in this graph is a clear separation between Britain where summer temperatures range from 8-12 ^{o} C (light green) and the area to its southeast, where Belgium is situated, where temperatures rise to the range of 12 to 16 ^{o} C (yellow). In fact Belgium seems to be in the same temperature zone with the greatest part of South-Western France. An interesting point to be made here is the following. Apart from the fact that climatic ameliorations might have made the occupation of Britain possible, they may have also made it desirable. As we'll see in the second part of this chapter meat seems to have been a very important part of Neanderthals' diet. Britain's lower temperatures might have facilitated meat preservation and this would have been an advantage for Neanderthal populations that moved in this area.

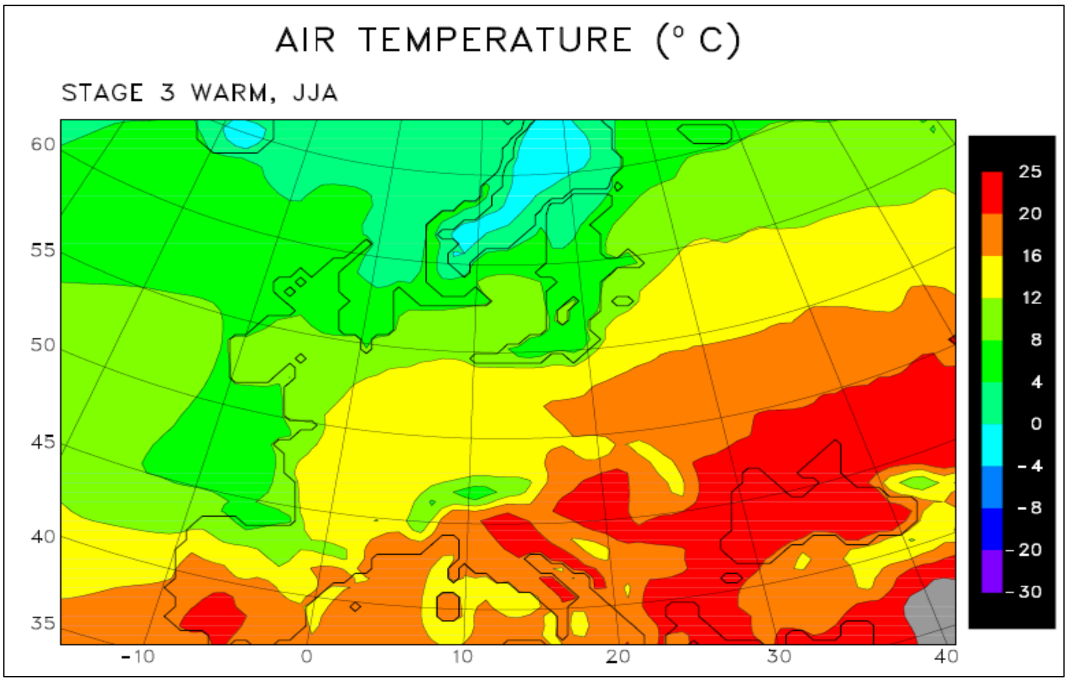


Figure 9: "Stage 3 Project" simulation of summer temperatures in Europe during the designated "Stage 3 Warm Phase". Available at www.esc.cam.ac.uk/oistage3/Details/Homepage/html

Figure 10 is a winter precipitation simulation for a Stage 3 warm phase. The greatest part of Britain seems to be in an area with higher precipitation than Belgium. This could have resulted in higher productivity in the environments of the British Isles, thus making them more attractive to Neanderthals occupying these high latitudes. Interestingly, the coastal part of South-Western France seems to be in the same precipitation zone. This could also have resulted in higher productivity in the environments of this area and it is consistent with the idea that Neanderthals would have occupied South-Western France in warm episodes.

Figure 11 is a winter temperature simulation of the LGM. We should expect these temperatures to have prevailed during the "extremely cold episodes" of MIS 3. According to the map the northern part of Britain is in the range of -8 to -20^0 C (dark blue). The southern part of Britain and the area of Belgium are in the range between -4 and -8 ^{0} C (light blue). The south-west of France though, is in a clearly different climatic zone, matching the temperatures of the north of Spain, ranging between 0 and -4^0 C (turquoise). Such a temperature grading could be seen to be in support of the idea that northern Neanderthal populations retreated to the south of France and north of Spain in the coldest MIS 3 episodes. The area which probably attracted the greatest size of population could have been South Western France, with its unique environmental attributes. These will be described in the section, dedicated to MIS 3 environment below.

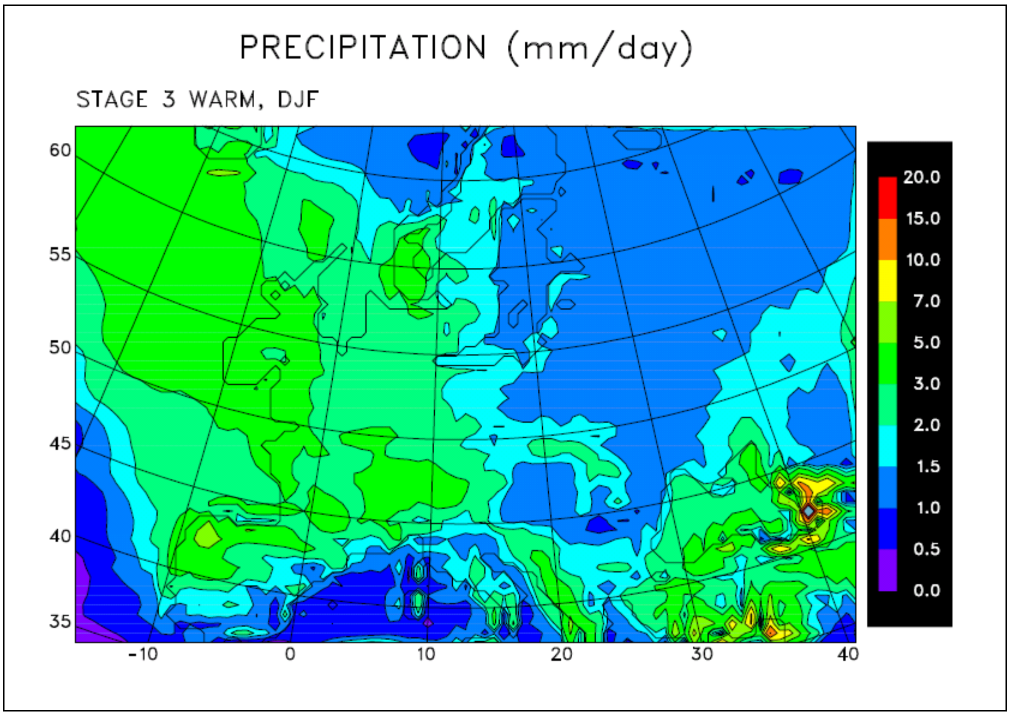


Figure 10: Stage 3 project simulation of precipitation during a warm phase in Europe. Data available at www.esc.cam.ac.uk/oistage3/Details/Homepage/html

Such an assertion can also be supported by the summer precipitation simulations for the type of conditions that would prevail during a cold episode, equivalent of the LGM. Figure 12 shows such a simulation. South-Western France seems to be the area with the lowest precipitation in comparison to Britain and Belgium. During the coldest episodes in MIS 3 high precipitation would have more likely been associated with high rates of snow fall. In this sense, the area of South-Western France would have been the most protected of the three. The only other areas in Western Europe that seem to be in the same precipitation zone as South-Western France are parts of Spain and areas of the continental self that are now submerged. Also, not surprisingly the only area that exhibits lower precipitation than South-Western France is the southernmost part of Spain, long now proposed to be one of the last Neanderthal refugia (Finlayson, 2008). In this context it would be justified to anticipate a congregation of Neanderthal populations in South-Western France, during the coldest periods.

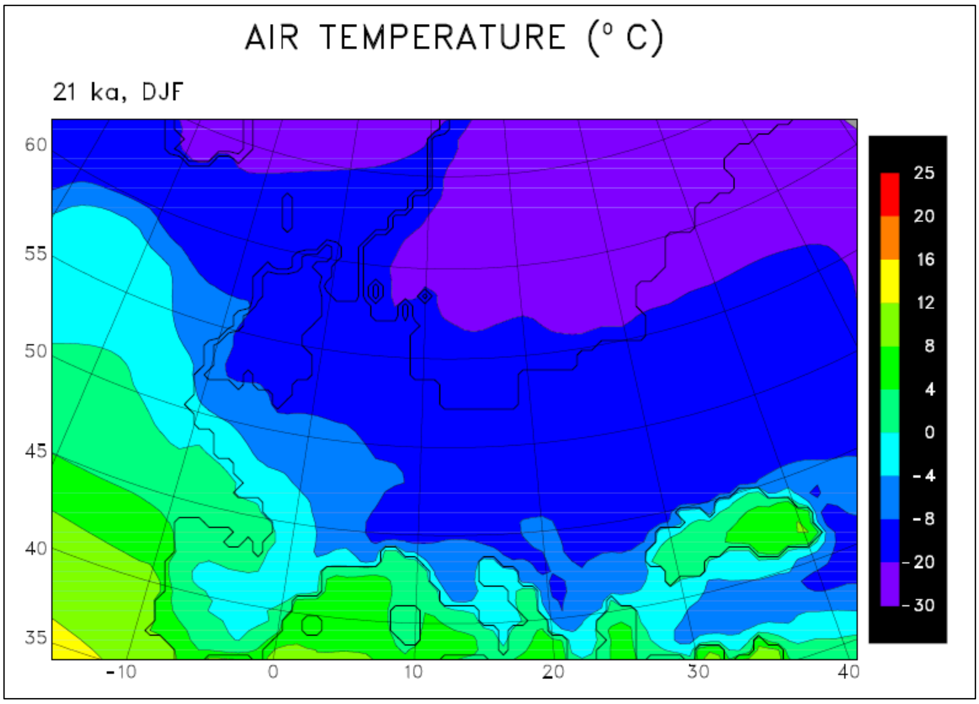


Figure 11: "Stage 3 Project" simulation of winter temperatures during the LGM. Available at: www.es.cam.ac.uk/oistage3/details/homepage.html

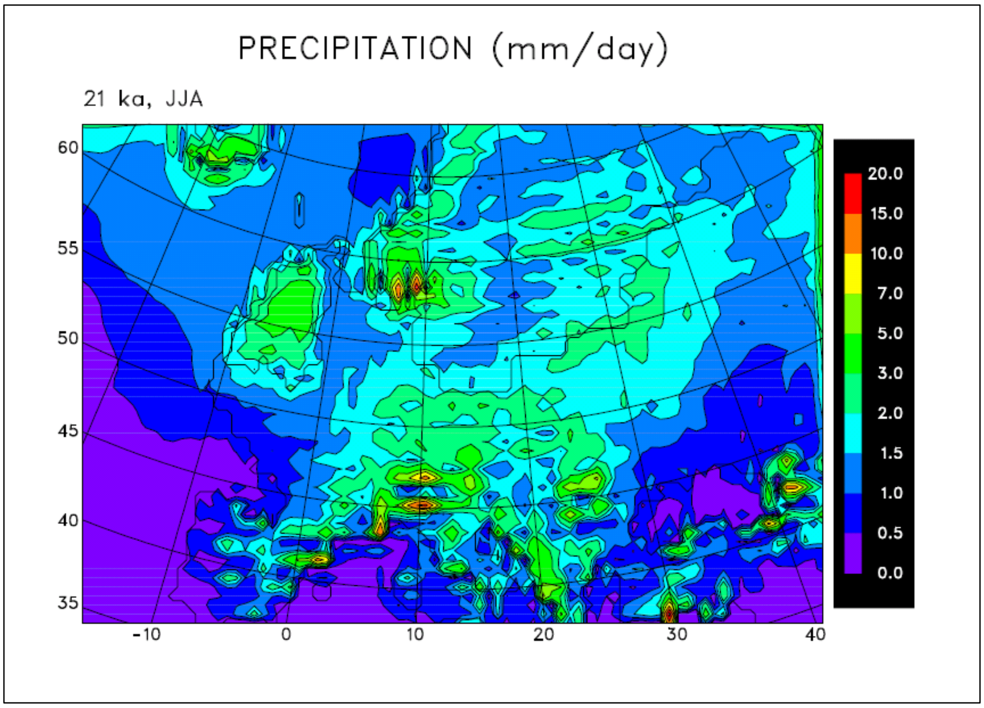


Figure 12: Stage 3 Project simulation of precipitation during the LGM. Available at www.es.cam.ac.uk/oistage3/details/homepage.html

In summary, by using the existing climatic data for MIS 3, I have generated some hypotheses to be tested in this thesis, on the existing archaeological data and dates from excavated deposits in Britain, Belgium and South-Western France. The hypotheses generated are:

1. Britain was occupied only during the peaks of the "mild episodes" of MIS 3. These will be pinpointed on the NGRIP core signal, and they will be tested against the available archaeological dates. A correspondence should have implications on the demography of Britain for this period. Small mobile populations occupying an area for only short periods are unlikely to leave very obvious archaeological signatures. Also occupation in "mild episodes" might mean a less intense occupation of caves. An opportunistic use of caves by Neanderthals would mean that they would have to compete with other carnivores, such as hyaenas that might have already established their presence there.
2. Ardennes, as a Northern refugium should have been occupied during the greatest part of the "mild episodes". In terms of demography we would expect a boost of population in comparison to Britain, due to longer duration of occupation, and hence more visible archaeological signatures. Also we could expect a more intense occupation of caves. Again here, the NGRIP signal will be compared with archaeological dates.
3. Finally South-Western France seems to be an area that could have been inhabited in all types of episodes. It is the only area that would have sustained a population, during the "extremely cold episodes". This would mean the largest population in average, the most intense occupation of caves, compared to all four areas, and of course the greatest number of archaeological sites with continuous occupation.

2.1.5 The MIS 3 Environment and regional micro-climate types.

It has already been mentioned that different data provide different scales of resolution, finer or coarser. Unfortunately the data for animals and plants in MIS 3 have a coarse character, giving only an averaged idea about the environment of this period. Despite the "Stage 3 Project" members' efforts to combine pollen data and computer simulations, in order to understand the vegetation patterns in Europe for this period, the chronological details and regional variations still remain poorly understood. This is mainly due to the fact that pollen records from big sequences cannot incorporate the details of more regionally specific variation and are by definition time-averaged. The most important information that should be kept in mind for the areas of North-Western and South-Western Europe, examined in this paper, is the following. During MIS 3 the vegetation was characterised by a mixture of open and closed habitats (Huntley and Allen, 2003). The warmer the climate, the greater was the presence of trees and temperate grassland. In the periods of climatic deterioration the presence of trees decreased and the temperate grassland was most likely replaced by steppe grassland. More area specific information about the vegetation can be inferred by faunal data.

MIS 3 fauna in Britain (Currant and Jacobi, 2001) is characterised by the presence of large herbivores, usually associated with what has been termed the “mammoth steppe” (Guthrie, 1982). These are woolly mammoth, woolly rhinoceros, wild horse, reindeer, bison giant deer and red deer. The latter species is present only in the south west of Britain (Table 1). These associations point to a largely open environment for MIS 3 Britain, while in the south west there could have been patches of woodland. Based on this we could infer possible seasonal faunal migrations for the periods that Britain was occupied, from largely open areas in the east to more protected habitats in the south west during the winter. The large carnivores present were wolf, spotted hyaena and lion. Neanderthals would have to compete with them to maintain their status as the top carnivore. With lion and hyaena the competition would have extended to living space, since both these two carnivore species and Neanderthals are found to be present in caves.

Southern Belgium is an area with a unique environment for this period, taking into consideration its geographical position. Here the elements of mammoth steppe mentioned before are found to coincide with forest taxa, like red deer and wild boar, montane taxa like ibex and chamois and more temperate taxa like roe deer (Stewart et al., 2003). This gives us the image of an area where multiple types of environments co-existed, a kind of environmental patchwork, providing Neanderthals with diverse resources. The presence of the temperate taxa is responsible for the identification of this area as a Northern refugium (Stewart and Lister, 2001). Whether these species really co-existed with the mammoth steppe elements, or their association is a result of time averaging, is impossible to say with absolute certainty. It may be possible to assume that these species had much wider tolerances in the past, including both open and closed habitats. There is no doubt though that in this area a micro-climate existed in periods of MIS 3, which was significantly milder compared to Britain.

	The North Midlands	**The East**	**The South-West**
Herbivores present in MIS 3 British sites.	**Creswell Crags**	**Lynford, Norfolk**	**Kent's Cavern** **Hyaena Den** **Uphill Quarry** **Coygan Cave**
Megaloceros *giganteus* (Giant Deer)	+	+	+
Cervus *elaphus* Red Deer	-	-	+
Mammuthus *primigenius* Woolly mammoth	+	+	+
Coleodonta *antiquitatis* Woolly rhinoceros	+	+	+
Equus *ferus* Wild Horse	+	+	+
Bison *priscus* Bison	+	+	+
Rangifer *tarandus* Reindeer	+	+	+

Table 1: Herbivores present in different British sites, dating to MIS 3. Information from Currant and Jacobi (2001), Jacobi et al, (1998), Boismier et al. (2003), Tratman et al. (1971), Harrison (1977), Pengelly (1870), Clegg (1970).

Finally, the area of South-Western France shows patterns similar to those of south Belgium. Again the same mix of taxa from different environments and altitudes is found. What makes this region special though, is the presence of true interglacial survivors (Stewart *et al,* 2003). Straight tusked elephant and Merck's rhino show persistence in temperatures and environmental associations, close to those of an interglacial. This validates the assumption that this area, in the overlap of the northern and Mediterranean zones, would have been the preferred refugium for northern populations in times of great climatic deterioration. The carnivores present here are the same as for the above regions.

Summarising the data given in this chapter so far, we could say that the environmental and climatic data supports a hypothesis of possible movement of Neanderthal populations, during MIS 3 from northern extremes to different types of refugia according to climatic severity. A new insight brought by the environmental information was the possibility for seasonal movement within Britain, from the open plains of the east to more forested habitats in the south-west, during the periods of occupation. These ideas will be tested on the archaeological information presented in the second part of this thesis, where archaeological dates will be integrated with the climatic information derived from the NGRIP climatic curve.

In the next section, I will now examine, not only how Neanderthals moved in the long term, between different areas, but also how they moved in the shorter term within one area. This way I hope to touch not only on the ecological, but also on anthropological dimension of Neanderthal occupation in Western Europe.

2.2. Neanderthals at the synchronic level: integrating ecological and anthropological approaches.

2.2.1. Introduction

In the second part of this chapter, I will build a heuristic model that aims to investigate Neanderthal lives at the synchronic level. To achieve this I will integrate archaeological, ecological and anthropological information. I chose to use a heuristic model because of the character of the available archaeological information from the Middle Palaleolithic. During the course of my research for this thesis, I came to the conclusion that the use of more rigorous models always entailed an aspect of determinism that obscured the actual variability of the archaeological data. The model proposed in this thesis is intended to be used more as a heuristic exploratory device and will be tested and discussed on the actual archaeological data from Britain, Belgium and South-Western France.

The model is analysed in the next sections of this chapter and includes the following elements:

1) In section 2.2.2., I will examine the ecological status of Neanderthals and their position in the food chain. This is important because it will provide the first link between the realities of Neanderthal survival strategies and the archaeological record (faunal assemblages, evidence for hunting, information from stable isotope studies).

2) In section 2.2.3., the ecological information on Neanderthals will be integrated with other archaeological and ethnographic data to outline Neanderthal everyday lives, in terms of home range, group size, and the dimension of time.

3) In section 2.2.4., I will investigate how the information, described in the previous two sections relates with the archaeological signal from Neanderthal sites. From the integration of these sets of data I will attempt to infer a tentative site typology that will link the evidence from archaeological sites and the inferred Neanderthal lifeways.

4) Finally, in section 2.2.4., I will describe the typology that I am going to use for the classification of the lithic artefacts from Neanderthal sites.

This model will be tested as follows. In chapters 3, 4, and 5, for each of the sites examined, I will describe the lithic assemblages with the lithics typology proposed in this chapter. Subsequently, all other available sets of data (faunal, pollen, climatic and topographical) will be integrated with the lithics. On the basis of this information, each site will be classified, according to the site typology proposed in this chapter. At the end of each of the case study chapters (3, 4, and 5) I will evaluate the validity and relevance of my model for understanding Neanderthal archaeology in MIS 3 for each of the three regions. The results of all three case-studies will be brought together in the final discussion in chapter 6 and conclusions will be drawn both on the character of Neanderthal occupation in MIS 3 Western Europe and the strengths and limitations of the model proposed in this thesis.

2.2.2. Neanderthals: a top-level carnivore.

The importance of subsistence behaviour as an evolutionary force was recognised as early as the 1960's, in the context of the New Archaeology. It was then that meat eating, and consequently hunting among hominids were given a central place within the debate about human origins. Collective attempts to integrate information from hunter-gatherer research into studies of human origins were made, with the purpose of shedding light on the hunting strategies of our ancestors. The best known of these attempts is the conference "Man the Hunter"(Lee and De Vore, 1968). It is obvious from the title for anyone having the advantage of hindsight that this was an age of innocence. Humans were basically understood as males and their status as hunters was simply assumed. Hunting was considered to be the most important aspect in the lives of our ancestors and it was perceived as an activity undertaken predominantly by men. These perceptions were to change in the following decade with the rise of the feminist movement. The importance of gathering, traditionally undertaken by women, was put forward (Slocum, 1975), while it was noticed that women were hunting as well (Estioko-Griffin and Griffin, 1981).

Parallel to these conceptual developments, the very idea of hunting, as the main subsistence strategy of hominids came to be in dispute. Taphonomic studies of bone assemblages, undertaken by Lewis Binford, showed that hunting amongst hominids should not be taken for granted. On the contrary it was possible that our ancestors, far from being proficient hunters, would only scavenge from the kills of other predators (Binford, 1981). Binford posed certain criteria for the distinction between assemblages occurring from hunting and those occurring from scavenging, on the basis of cut marks, gnawing marks and representation of different skeletal parts in the assemblages. The predominance of heads and feet in an assemblage was taken to indicate scavenging, since these are the last parts of the body eaten by carnivores after a kill.

The discussion of hunting versus scavenging had important implications for the perception of other aspects of hominid life as well. Hunting had been connected with the idea of a *home-base*, where the hunters would return to meet with the rest of the group and share food (Isaac, 1971, Isaac, 1981). This was termed *central place foraging*, as known from the studies of modern hunter gatherers. The co-existence of lithic and faunal remains at a Palaeolithic site was taken to indicate the classic modern hunter-gatherer base camp, where the members of the group would meet after their daily activities.

This idea of *central place foraging* was contradicted by Binford, who believed in a more opportunistic acquisition of meat. In his study of the faunal remains from the South African, Middle Stone Age site of Klasies River Mouth, he outlined his own model of hominids' land use patterns (Binford, 1984). In his view the occurrence of stone tools and faunal remains in the same site was not adequate to support the *home base* model. What he proposed was a land use pattern, based on the movement between different vital resources, food, water, and shelter. These resources were usually encountered in specific loci and the latter constituted places, where hominids returned repeatedly as they led their everyday lives. In this sense, what he proposed was a use of different places in the landscape by hominids, without any of these places having a central role. This model was named the *routed feeding model*.

The *central foraging model* and the *routed feeding model* implied not only different land use patterns but also different patterns of social organisation amongst hominids. In the case of the first, the existence of a *home base*, related with food sharing, would also mean a division of labour, and a logistical complexity in everyday activities. This of course would directly point to an analogy with the life organisation of modern hunter-gatherers. On the other hand, the *routed feeding model* did not imply this kind of complexity. In Binford's (1985) view there was no evidence to show that a hominid group would split up to perform different tasks, or that they would all meet up again at a specific *base camp* to share the products of their efforts. He inferred the movement of a group as a whole and the communal exploitation of various resources. It was a different view about the role of hominids in the landscape. While in the *central foraging model*, hominids were active hunters with primary access to carcasses, in the *routed feeding model* hominids had a more marginal role, arriving at kill sites after the other carnivores had finished eating. In this sense their acquisition of meat did not require more forward planning and co-operation than any harvesting of wild plant food. Binford's view was more in line with an analogy related to the land use patterns and social organisation of the hominids in the Plio-Pleistocene boundary (Binford, 1985).

Binford's critique of the idea that hunting was the predominant subsistence behaviour in the Palaeolithic prompted more rigorous taphonomic studies of the faunal assemblages. What was taken as a given up to that point, now had to be put to meticulous examination and the studies of Palaeolithic behaviour benefited as a whole from his approach. However, his view that organised hunting did not occur until the Upper Palaeolithic and was a distinct characteristic of modern human adaptation, was to be contradicted by studies in the following years.

Chase's (1986) study of the faunal assemblage from Combe Grenal was in strong opposition to Binford's conclusions on what Middle Palaeolithic hominids were capable of. Chase pointed out that cut-marks are specifically suggestive of the defleshing of meaty carcasses and their absence should not be taken as negative evidence for hunting. He also gave an alternative explanation for the overrepresentation of heads and feet, proposing that more meaty bones had been transported elsewhere (Chase, 1986). Other researchers took similar positions against scavenging being the main strategy used by hominids for meat acquisition (Klein, 1989). The debate continued in the 90's with Mary Stiner being the main supporter of scavenging as one of the aspects of Neanderthal subsistence (Stiner, 1994). Stiner's study of the fauna from the Pontinian Mousterian in Italy was based on the same criteria used by Binford in his studies from Combe Grenal and Klasies River Mouth (1981, 1984). She concluded that only after 50,000 years ago there was a turn to more active hunting and she related this to general changes associated with the appearance of modern human behaviour. Contrary to Binford, she did not see Middle Palaeolithic hominids as obligate but as opportunistic scavengers that engaged in both hunting and scavenging adapting to different conditions. Her conclusions were later shown to be far from certain, since the material she examined came from old excavations, conducted in the 30's and 40's, when collector's bias could have affected the composition and character of the assemblages (Marean, 1998).

Although this critique needs to be taken seriously, it does not mean that older assemblages should not be incorporated in modern interpretations. It is important though, when dealing with such assemblages, to be very cautious. Building theories, based on assemblage compositions is always risky. The remains found in an archaeological layer do not always include all the elements discarded in the past. In the Palaeolithic we are dealing with vast periods of time and a great range of geological processes often change the original composition of layers. Of course the risk increases even more when we cannot be sure that all the contents of a layer were collected during excavation. In such cases except from studying the site formation processes, modern researchers should try to understand the excavation philosophy of earlier archaeologists. One more possible explanation for the absence of an artefact can always be that at the time of the excavation it was not considered to be important.

Marean’s critique (1998) included sites studied by both Stiner and Binford, on which the theory about scavenging in the Middle Palaeolithic has been based. He identified representational biases, which had occurred either in the collection during excavation but also similar biases, which occurred during sampling in the case of Grotte Vauffrey, studied by Binford. What he did next was to take samples from two other sites, where all the faunal elements had been collected during excavation and study the material in two ways. First he examined the material, replicating the representational biases identified in Binford’s and Stiner’s work, and then he repeated the study using the whole range of bone specimens. In the first case the results pointed to a scavenging strategy, while in the second the same assemblages indicated hunting. Marean’s study raised serious doubts about the evidence for scavenging in the Middle Palaeolithic, although he made clear that this should not automatically be taken as evidence for hunting.

In the mean time other studies from various parts of Eurasia have all been showing that the Middle Palaeolithic population of this area had direct access to meat resources. Evidence for a fragmented Levallois point embedded in the vertebra of a wild ass has been reported from the site of Umm el Tlel in Syria (Boëda et al., 1999). The fragment, as reported, was probably hafted and was part of what most likely was a thrusting spear, or a spear thrown from a short distance. The type of wound caused would have immediately incapacitated the animal by paralysing its limbs. The use of this kind of hunting technology and the accuracy of the hit show a certain degree of sophistication in the hunting techniques of Middle Palaeolithic hominids.

More information, in connection with Middle Palaeolithic hunting strategies, comes from the site of Salzgitter-Lebenstedt in Northern Germany (Gaudzinski, 2000). Gaudzinski, who studied the faunal assemblage from the site, noted the predominance of reindeer bones. These were in direct association with the stone tool assemblage. She noted evidence of human modification on 70 % of the bones and also noted a tendency for the most nutritional parts of the carcasses to be used. Gaudzinski (ibid) believes that it is impossible to distinguish Middle Palaeolithic hunting strategies from Upper Palaeolithic ones, based on the evidence from Salzgitter-Lebenstedt.

Parallel to the above mentioned faunal studies another type of research has arisen during the past fifteen years that leaves no doubt about Neanderthals' capacity for acquiring meat. This is the research based on stable isotopes. The stable isotopes method is based on the extraction of collagen from the ancient animal skeletons and the analysis of its composition. The focus of this analysis is the carbon and nitrogen isotopes passed from plants to herbivores and from herbivores to carnivores. Comparisons of the values of these isotopes in the skeletons of herbivores and carnivores reveal the place of different animals in the food chain (Bocherens *et al.*, 2005).

For this method to work, it is necessary that all the animals sampled are from the same geographical area and that they belong to the same time frame. The first study of stable isotopes from Neanderthal bones in the beginning of the 90's (Bocherens et al., 1991) did not take these restrictions into account. The Neanderthal bones studied in the site of Vindija did not come from the same levels as the comparative sample used from other animals. Another problem with this method is when the bones studied come from a very young individual. Individuals who are still breast-feeding are subject to the nursing effect. This means that because the milk has similar isotope values to their mother's tissues, very young individuals tend to have isotope values similar to predators one level higher in the trophic chain than adults of their species. This restriction shows, for example, the sample from the Engis child in Belgium to be unreliable (Bocherens et al., 2001).

The Engis child was 5-6 years old and given the current uncertainty on the weaning age for Neanderthal children it is very possible that this sample was affected by the nursing effect.

Site	Age	Context	Anatomical part
Scladina Cave (Sclayn, Belgium)	MIS 5c	SCLA 4A 2	Skull fragment
Les Pradelles (Marillac-le-Franc, Charente, France)	MIS 3	M70 c10 F10-41	Skull fragment
Les Pradelles (Marillac-le-Franc, Charente, France)	MIS 3	H1	Mandible
Les Pradelles (Marillac-le-Franc, Charente, France)	MIS 3	H2	Skull fragment
Spy (Betche-al-Roche) Cave (Belgium)	MIS 3	SPY OMO 1	Scapula
La Roche-à-Pierrot (Saint-Césaire, Charentes-Maritimes, France)	MIS 3		Fibula

Table 2: Details of the 6 Neanderthal specimens used in (Bocherens et al., 2005).

In one of the most recent publications on the subject Bocherens *et al.*, (2005) review the totality of the samples examined in the past fifteen years. According to this report, if all the problems of the method are taken into account, only the results from six Neanderthal specimens can be considered to be reliable. These are five specimens dating to MIS 3 and one from MIS 5c (Table 2). The results consistently prove Neanderthals to be a top level carnivore with a preference for the consumption of big, open environment, herbivores, and more specifically woolly rhino and woolly mammoth. It is interesting that this pattern is consistent throughout, despite the apparent differences in environment, geography and age between MIS 3 and MIS 5c. It would be expected that at least some differences would have occurred between MIS 5c and 3, since in the first case we are dealing with a generally more forested environment, where woodland species would be equally or even more available than the open environment species. On the other hand, we should always keep in mind that this remains a small sample. It is possible that in the future the examination of more specimens could show a different pattern, at least for MIS 5c, when different environmental conditions prevailed. On the contrary in the case of MIS 3, which is the focus of this thesis, the pattern observed in the stable isotope studies is consistent with the general environmental conditions and in this sense it seems to be a more reasonable conclusion.

The fact that, with the existing evidence, this pattern of Neanderthals consuming big herbivores from open environment proves consistent through such a long period of time within different environments and different areas highlights the possibility that we are dealing with an adaptation very well embedded in the behavioural repertoire of the species. It seems that Neanderthals were the first member of the human lineage that managed to occupy this very specific niche of subsisting mainly on big herbivores. The reasons for this could partly lie in the more common use, during this period, of sophisticated hunting technology, like Levallois and Mousterian points. At the same time I would expect a significant increase in the degree of co-operation and cohesion amongst Neanderthal groups for such dangerous hunts to be successful. Whatever the reasons for their choice, I believe that it could have had a great impact on the way Neanderthal identities would have been constructed as big game hunters. This choice would have set them apart from the other predatory animals of that period that went after less dangerous game. Information about the dietary habits of other MIS 3 carnivores, compared to those of Neanderthals is provided below.

A new model for the examination of stable isotopes (Bocherens, *et al.*, 2005), in relation to more than three dietary sources, made possible a detailed comparison between the diet of hyenas and the St Cesaire Neanderthals, within the same time period. Neanderthals and hyenas showed the same dietary patterns for bovids, giant deer and horse, but different for reindeer, woolly rhinoceros and woolly mammoth. Reindeer was consumed by Neanderthals only up to 5%, while its contribution to hyenas' diet ranged from 5% to 40%. On the contrary woolly rhinoceros contributed from a few, up to 60% in Neanderthals' diet, while it composed less than 20% in the diet of hyenas. This contrast was even more pronounced in the case of woolly mammoth. For Neanderthals the contribution of mammoth ranged from 15% to 70 %. For hyaenas it was never higher than 15%.

Furthermore the authors (*ibid*) examined an overview of the isotopic data for spotted hyaena, a known opportunistic predator and scavenger, in the wider area of Western Europe, around 36,000 years ago, including France, Britain, and Belgium (Bocherens et al., 1995, Bocherens et al., 1997). The pattern revealed that nowhere were woolly rhinoceros and woolly mammoth an important part of hyenas' diet. If these carcasses were available in relative abundance in the landscape they would have made their way into hyenas' diet. Since they did not, the authors suggest that these animals were not usually found as carcasses. In this case how would Neanderthals acquire so large amounts of this type of meat? Only one explanation remains. These two species were selectively targeted by Neanderthals and hunted in an organised way. The possibility that this pattern of selective meat consumption from large herbivores is a distortion, caused by the fact that the method cannot recognise the signatures of plant food, is rejected by Bocherens, *et al.* (2005). In fact if a part of Neanderthals' diet was based on plants, which is possible, this would mean that much bigger quantities of meat would have had to be consumed to produce these isotopic signatures. This is also supported by a different line of evidence (Balter and Simon, 2006). Balter and Simon examined the St. Césaire Neanderthal skeleton, using a method of biogeochemical data inversion. The results showed that consumption of plants by Neanderthals must have been close to zero.

A more recent study of isotopic dietary analysis was undertaken at the site of Jonzac (Richards et al., 2008), also in South-Western France. In this latter case the pattern of Neanderthals mainly consuming large herbivores was confirmed again. This time the most commonly consumed animals were bovids and horses. Again hyaenas showed to be more likely to consume relatively smaller animals, like reindeer.

It has been made apparent from the evidence presented in this section that there is not much doubt about Neanderthals' ability or tendency to acquire meat in a direct way. A lot of the theories to the contrary have been contradicted by an overwhelming set of data produced in the past fifteen years. Neanderthals were not only the top predator of their times, but they would not hesitate to take down animals as huge as the woolly mammoth. This has very important implications, in terms of social organisation. This kind of very dangerous activity points to a type of socially organised co-operative hunting. It could potentially take a whole group to take down animals of this size, with different parts of the group, possibly undertaking different tasks. The earliest evidence for this kind of co-operative hunting comes indeed from the Middle Palaeolithic, and more specifically from the MIS 7 (c. 250,000 years ago) levels of the site of La Cotte de St. Brelade, in the English Channel Island of Jersey. According to the site publication (Callow and Cornford, 1986), hunting of mammoths, which included driving them down a cliff, occurred on this site. This is a characteristic case, where a group of “archaics” would have to show a certain degree of co-operation to achieve a successful hunt. Once more in the history of human evolution research, diet and society seem to tie very well together. The social implications that this carnivorous diet would have on Neanderthal communities will be explored in greater detail in the next section.

2.2.3. Neanderthal communities: group size, range size and energy requirements.

The usual inferences about hominid group size are based on the data collected from the studies of modern hunter-gatherers. A number recurring in the bibliography, as an average for the smallest viable unit in hunter-gatherers' social organisation, is twenty-five. Wobst produced this result using computer simulations (Wobst, 1974), and a series of ethnographic studies from across the globe re-produced in other works (Binford, 2001, Lee and De Vore, 1968) confirm this interpretation. On the other hand, Binford (2001) noted that groups between twenty and twenty-five individuals are usually associated with hunter-gatherer societies, where there is an apparent sexual division of labour. He estimated that if this division of labour were to collapse a number of approximately eight individuals would be sufficient to ensure the survival of the group.

In general, it is very difficult to make any assertions about the existence of sexual division of labour in the society of an extinct species, Neanderthals in this case. Indeed, this is a subject, on which no direct evidence exists. In the past, the emergence of sexual division of labour in hominins has been placed as early as the late Pliocene (Lovejoy, 1981, Isaac, 1978). This was based on the idea that any type of food-sharing would necessarily involve sexual division of labour and that the archaeological evidence points to at least some type of food sharing at sites characterised as home bases for that period. This idea has been disputed more recently (O'Connell et al., 2002, Wrangham et al., 1999). On the other hand, until recently, no such discussion had taken place with specific relevance to Neanderthals.

In 2006, Kuhn and Stiner made an attempt to open this discussion, because they thought that this issue could be relevant to the Middle to Upper Palaeolithic transition (Kuhn and Stiner, 2006). Their argument was based on the fact that sexual division of labour in modern hunter-gatherer societies is usually based on the following distinction between men’s and women’s tasks. Men tend to hunt the larger animals, while women hunt smaller animals and contribute also to the vegetal part of the diet by gathering plants. Kuhn and Stiner (*ibid*), taking into account the constantly increasing evidence for Neanderthals subsisting on big animals (see previous section) suggested that it is very possible that there was no need for this kind of distinction in Neanderthal societies. By this they meant that women and children could have also taken part in the hunt of big animals, albeit with roles that would not involve the same amount of danger. They also referred to ethnographic examples from high latitude hunter-gatherer communities, where animal resources are very important and where there are cases of women hunting (Briggs, 1970), and the robust Neanderthal anatomy common in males and females, indicating an active lifestyle common for both sexes.

In my opinion, Kuhn and Stiner’s (*ibid*) argument does not contradict the existing archaeological evidence and in this sense seems quite reasonable. On the other hand, as with many interesting theories that deal with the structure of Palaeolithic societies, it can neither be easily proved nor falsified, especially when it is based more on the absence of evidence than evidence itself. In this sense, it remains just an interesting hypothesis, but one that could be integrated in the investigation of Neanderthal lives, adding a greater range of possibilities. It is in such way that it is used in this thesis.

In order to model the basic aspects of Neanderthal lives, it is important to have a rough idea of the minimum number of persons in their groups. Given that there is no direct evidence on the subject, the obvious source of information is the ethnography of modern hunter-gatherers. It was mentioned earlier that the minimum number of persons for a modern hunter-gatherer group is 25 with a sexual division of labour and estimated as 8 without it. Because the subject of sexual division of labour in Neanderthal societies is still inconclusive both possibilities will be taken into account. So, instead of a minimum number of persons a minimum range will be used in this model, to make sure that all different possibilities are taken into account. This range for the needs of this theoretical exercise will be taken to be between 8 and 25.

Moving to the subject of the ranges occupied by Neanderthal groups most of the information, up to now, comes from the studies of raw materials transferred in Neanderthal sites. The two most influential studies on the subject (Féblot-Augustins, 1993, Geneste, 1985) relate to sites in the area of South-Western France. Both studies have showed an emphasis on the use of local materials coming from a range of zero to seven km around the site. Gamble (1999) based his model of a localised Neanderthal society on the results of these studies. Indeed it is possible, since Neanderthals acquired most of their lithic resources within this small radius that this area was also the focus of their daily activities and hence the limits of their everyday foraging range.

Another approach (Steele, 1996) was to use a model, developed for estimating the size of undefended carnivore territories (Grant et al., 1992), based on group mass. He estimated Neanderthals’ groups’ mass using the supposed ratio between males, females and juveniles in a group as proposed by Clutton-Brock and Harvey. According to the latter it is possible to estimate a ratio of one male, one female and two juveniles for each group (Clutton-Brock and Harvey, 1977). He also took into account McHenry’s estimation of Neanderthal body weight for males and females, estimating an average weight for the juveniles (McHenry, 1996). His study showed that for a group of twenty-five Neanderthals, we should anticipate a home range with a diameter of about thirty-two km. In this hypothetical circular range the actual radius in which Neanderthals would have moved around their sites should be sixteen kilometres. If we take into account a smaller group of about eight individuals, it is very possible that this range would have been significantly smaller, and maybe even closer to the one predicted by the studies on raw material transportation. Taking into account possible differences in group sizes, Neanderthal daily ranging patterns should be expected to be in the area between 0 and 16 km.

The final part of this section is devoted to Neanderthal energetic requirements. An attempt will be made to integrate information about the latter, with the meat and calorific yield of hunted animals, in order to outline more of the details of Neanderthal everyday lives. What I intend to do is calculate the sum calorific requirements for Neanderthal groups of different sizes. We have already seen that Neanderthal groups could have been consisting from as few as eight to as many as twenty-five or more individuals. Using the Clutton-Brock and Harvey ratio mentioned above, groups of different sizes can be analysed to males, females and juveniles. After that it is important to calculate energy requirements for each component of the different groups and add them to have the total group requirements, according to each group's size.

Sorensen and Leonard in a paper examining the relation between Neanderthal foraging efficiency and their energetic requirements (Sorensen and Leonard, 2001) calculated that Neanderthal women would need a daily intake of between 3,000 and 5,000 kcal, while Neanderthal men would need 4,000 to 6,000. If we take the minimum estimations we need 3,000 kcal for each woman in the group, and 4,000 kcal for each man daily. It is very difficult to calculate energy requirements for juveniles since there is constant change in their development (Tontisirin and De Haen, 2001), and it would depend a lot on whether they were infants, children, or adolescents. Also, there is no way to know how many of these juveniles were males and how many females, another factor that would impact their energetic requirements. In order to produce a minimum estimation here, I will infer that all these juveniles were females and I will use as an average value for their energetic requirements, half the requirements of an adult female. The sums of the energy requirements for different group sizes, according to my estimations, are presented in Table 3.

Total Group size	**Males**	**Females**	**Juveniles**	**Requirements (kcal/day)**
8	2	2	4	20000
12	3	3	6	30000
16	4	4	8	40000
20	5	5	10	50000
24	6	6	12	60000

Table 3: Daily energy requirements, according to group size. The group composition ratio is calculated as 1 male per 1 female per 2 juveniles.

We have already seen in the previous section that, according to the isotopic evidence, Neanderthals were subsisting mainly on woolly mammoth, but they would also hunt smaller animals like reindeer. Guthrie estimated a weight of 3,000 kg for woolly mammoths (Guthrie, 1968) that would yield a usable meat weight of 1,800 kg (Wing and Brown, 1979). Klein estimated 2,000 kcal per kg of woolly mammoth meat (Klein, 1969). On the other hand, a live reindeer would weigh about 100 kg (Guthrie *ibid*) and would yield a usable meat weight of 60 kg (Wing and Brown *ibid*). Klein (*ibid*) estimated 1000 kcal per kg of reindeer meat. It may be possible, using these estimations and the energetic requirements of groups, presented above to produce some hypotheses regarding how long Neanderthals could subsist on meat from these two animals.

To approach this subject, I examined a range of hypotheses. These hypotheses were concerned with how much meat an individual Neanderthal was able to carry. Neanderthals were very robust hominids, but on the other hand we do not know to what extent they could facilitate transportation with artificial means, like leather bags, or tying carcasses to poles. For this reason I used a hypothetical range between 10 and 25 kg per individual adult Neanderthal, assuming that juveniles could carry half of this weight each time. Using again the Clutton-Brock and Harvey (1977) ratio for the composition of a group, I estimated the amount of meat that could be carried away in each case, according to the group size. Due to the fact that carrying ability and energetic requirements of a group both increased proportionately with group size, the amount of time that Neanderthals could spend, subsisting on the carried meat was not affected by group size. In this sense, the time values presented in figure 13 are valid for Neanderthal groups of all sizes. These values are likely to be the maximum, since they were calculated with the minimum values of energetic requirements.

Figure 13 shows the duration of time that a Neanderthal group of any size could spend subsisting on the carried meat, for a range between 10 and 25kg of mammoth and reindeer meat carried by each adult. It seems that Neanderthals could have carried away enough mammoth meat to feed a group for a period of 6 to 15 days, while in the case of the reindeer the meat could have lasted for a period between 2 and 5 days. It would be reasonable to expect that values closer to the lower end of this scale would occur during the summers, while higher values would occur, during the winters, due to different temperatures, as the meat would preserve longer.

If the above estimations are valid, we would expect that a period of 3 to 15 days would go by between the time, when a Neanderthal group would make a kill, and the time they would have to move on and look for their next prey. The actual time would depend both on the calorific yield of the animals killed and the climatic conditions prevailing each time.

All these activities would have probably taken place, within the small radius (0-16 km, see above) predicted from the distances covered for the procurement of the main materials, used in Neanderthal sites. In this case what would be the significance of raw materials coming from further distances? On the other hand, only two types of sites are predicted by such a model, kill sites and short stopover sites, where groups would eat and rest. What about the other types of sites usually described as *raw material extraction, residential,* or even *lithic workshop* sites? The subject of different types of Neanderthal archaeological sites and their behavioural interpretation, within a daily life framework will be discussed in the next section.

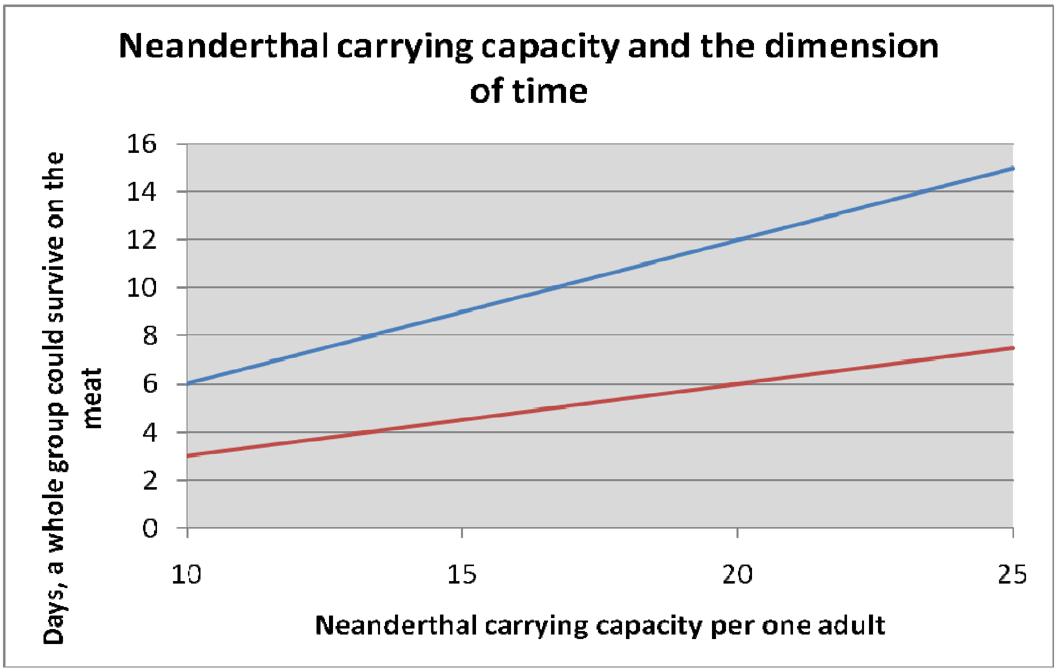


Figure 13: Graph showing estimations of, how many days a Neanderthal group of any size between 8 and 25 could subsist on carried meat, according to adult individual carrying capacity. The blue line indicates the estimations for mammoth meat, while the red line indicates the estimations for reindeer meat.

2.2.4. Neanderthal sites: searching for categories.

This section is dedicated to one of the most difficult problems to tackle, as far as Neanderthal archaeology is concerned. This involves the interpretation of Neanderthal archaeological sites. In these terms Neanderthals do not seem to be much different than the earlier Palaeolithic hominids, their sites comprising processed animal bones and lithic artefacts. Taking this into account we should examine the model proposed in the, now, classic paper by Isaac (1971) about hominid subsistence in the Lower and Middle Pleistocene. This model has been very influential and it has underlain, either explicitly or implicitly much of the interpretation of Palaeolithic hominids' archaeological sites, antedating the emergence of modern humans (Bordes et al., 1972, Binford, 1982).

Isaac's model is based on the relative proportions of animal remains and lithic artefacts in Palaeolithic sites. According to him there are four kinds of sites (ibid):

a) Sites, where there is low density of bones and stone artefacts. These are called the *transitory camps*, and are considered to be places that were not visited very often, or possibly visited only once.

b) Sites, where there is abundance of bones but relatively few stone artefacts. These are called the *kill/butchery sites*.

c) Sites, where there is abundance of stone tools, but no bone remains. These are called the *extraction/workshop sites*.

d) Finally, sites, where there is abundance of both bones and stone tools. These are called the *camps or occupation sites* and are considered to be places that were either visited often for short periods or less often for longer periods.

The greatest strength of Isaac's typology is that it is based on the most durable elements in Palaleolithic archaeology, stone and bone. In this sense, it is quite practical and easy to apply in most Palaeolithic contexts. Below, I will investigate if and to what extent this typology could be relevant and useful for the interpretation of Neanderthal sites. I will also integrate it with ethnographic information from modern hunter-gatherers and modern social carnivores, in order to formulate the site typology that will be used in this thesis.

I will start with the *transitory camps* and the *occupation sites*, categories a) and d). I have put these two together, because they seem to represent differentiations of the same type of occupation. The difference between the two is related either to the frequency of the visits or their duration, depending on the interpretation of category d). Unfortunately, questions of frequency and duration of visits are usually very difficult to be answered in the Palaeolithic in general (Bailey, 2007) and even more in Neanderthal archaeology (Pettitt, 1997). For this reason I think that it would be better to include these two types in one category under the name occupation sites and judge the duration and frequency of occupations, according to the available evidence in each specific case-study.

In terms of carnivore behaviour, these occupation sites can be understood, as sites where Neanderthals spent time after having killed animals and carried their meat there. These places might have had the advantage of being defensible from, or not easily accessible to other carnivores. It is known that leopards in India store their meat high in trees, where other carnivores cannot climb (Kruuk, 1972a). Hyaenas in East Africa, on the other hand, store meat in standing water of a considerable depth, where it is preserved and its smell is masked from other carnivores (Kruuk, 1972b). It is possible that the equivalent safe place for Neanderthals would have been a cave with a fire at the entrance, provided that there was one in the vicinity. The stable temperature of the cave for the preservation of meat would have been an extra advantage. Food consumption would have taken place along with the manufacture, use and discarding of stone tools at such places. The reasons why some of these places were visited more than the others cannot be easily clarified, and there is no way it can be generalised across time and space. Time/space specific studies can only shed light on such matters and an attempt will be made with the use of specific data, dating to the Later Middle Palaeolithic of Britain, in the next chapter.

Turning to category c), the *workshop/extraction sites*, an inference is made about a purposeful expedition to places with good raw materials, where knapping is performed and artefacts are carried away to be used in other places. Although this is a quite plausible assertion, there is no known study up to now proving that material from this kind of site was systematically transported somewhere else. This possibility of course cannot be ruled out, but in any case, this would require an exact match of the dating of different types of sites, which for now seems impossible, due to the apparent time averaging of Palaeolithic assemblages. Mining for raw materials in the Middle Palaeolithic has been identified in sites of Central Europe (Ringer and Szakall, 2005), but no such evidence exists up to now for Western Europe, which is the focus of this thesis.

Beyond this type of difficulty in the record, anticipated for the Palaeolithic, I believe that the actual terminology used for this category is misleading. Referring to *workshops* and *extraction* sites paints a picture of hominids organising their lives, in a way that is reminiscent of industrial societies. Specialised groups would be sent to extract and process the material, to supply the rest of the group. But we have seen in the previous section that it is quite possible that Neanderthals lived in very small groups, with no division of labour. In this case we could imagine the whole group visiting these areas with only one purpose, the acquisition of raw materials. But is this how Neanderthals would have understood their reality? Breaking the landscape and everyday life into such categories, can be useful for the modern researcher. Finding the proof for such logistical complexity can be of use in the debate about how “Modern” Neanderthals were, but what would it mean to Neanderthals themselves?

The anthropological approach, built in this thesis, is based on one of the two certainties we have about Neanderthals. The fact that they mainly subsisted on big herbivores, the other being that they made sophisticated stone tools. Where in their lifestyle of following herds in the landscape, of killing animals and eating them, would the *raw material extraction sites* fit? I propose that the type of site, where knapping has occurred, without faunal remains present, can be understood as another type of stopping place in the landscape, but this time not to kill or eat. It could have been a type of hunting stand, a place to rest, and possibly observe the surrounding area. Knapping would have played the role of preparation for the hunt, as well as recreation, and bonding of the group. Binford recorded a range of activities that Nunamiut Eskimo hunters perform to pass the time, while waiting in hunting stands to spot the migrating herds, including games and competitions (Binford, 1978).

Communal activities performed with the purpose of bonding a group of social hunters have been observed in modern social carnivores as well. The spotted hyaenas, belonging to the same group, perform a series of communal activities related to marking their territories. These are usually urinating and pasting scent on the territory boundaries (Kruuk, 1972, p.241). Very interestingly they are known to perform another activity, which is not related to territory marking, and has no other apparent function, apart from social bonding. This is called “social sniffing” (Kruuk, *ibid*). Kruuk describes how one hyaena will bend and start sniffing the ground at a randomly picked place, and immediately the other hyaenas in the group will follow. Frequently a group which has undertaken this activity for about an hour will also hunt together. Another “compulsively social” carnivore is the Bush Dog, relative of the wild dog. These are known to start their day with a ceremonial whistling, before setting off to patrol their territory as a group (McDonald, 1992).

Finally about category b), the *kill/butchery site*, I am not in serious disagreement with Isaac’s model, as long as the palimpsest factor is again stressed well enough. Places in the landscape, especially near standing water, where herbivores would have gathered to drink would be also visited consistently by Neanderthals, who were after their meat. Also river valleys, through which herds might have travelled, are another place, where this type of site would occur. These places would have been visited repeatedly and been the witnesses of kills and butchery activities, performed by Neanderthals for as long as climate fluctuations did not change their specific character, and did not affect herbivore behaviour.

In conclusion, I propose the following classification for interpreting Neanderthal sites:

a) Rest/recreation/observation sites, b) kill/butchery sites, c) food consumption/resources processing sites.

2.2.5. A descriptive framework for Neanderthal lithic assemblages.

In this section, I will briefly present the simplified typology that I am going to use for the presentation of the lithic assemblages in this thesis.

The main categories that are going to be used are the following:

1. <u>DEBITAGE</u>

a) Flake: A piece that has been flaked from a block of raw material. It is longer than 2 cm and it preserves its proximal, distal and lateral parts.

b) Broken flake: A flake that exhibits a break, but its original form is still visible. It is longer than 2 cm.

c) Flake fragment: A broken piece that can be identified as deriving from a flake, although the original form of the flake is not visible.

d) Chip: A whole flake that is shorter than 2 cm.

e) Flake shatter or debris: A flake fragment that is shorter than 2 cm.

f) Blade: a flake that is twice as long as it is broad and has derived froma prismatic core.

g) Broken blade: A blade that exhibits a break, but its original form is still visible.

h) Blade fragment: A broken piece that can be identified as deriving from a blade, although its original form is not visible.

i) Levallois flake: a flake of predetermined shape (Bordes, 1961a and Boeda, 1993).

j) Retouch spall: A flake that has derived from the making of a retouched tool. This flake preserves on its dorsal part of the retouched edge of the original tool.

k) Sharpening spall or flake: A flake that has derived from the re-sharpening of a retouched tool.

l) Thinning flake: A flake that has derived from the reduction of a handaxe.

m) Naturally damaged piece: A piece of debitage that exhibits signs of post-depositional damage.

2. <u>CORES</u>

a) Core: A block of raw material from which pieces have been detached by the method of percussion.

b) Levallois core: A core which exhibits a clear hierarchy in the use of its upper and lower surfaces. One is used for preparation and one for the detachment of predetermined flakes (Boeda, 1993).

c) Discoidal core: A core which does not exhibit a hierarchy in the use of its upper and lower surfaces. Flakes that are not predetermined are detached from both (Boeda, 1993).

d) Prismatic core: A core from which mostly blades have been detached with the method of parallel flaking.

e) Globular core: A core that does not follow a clear and specific plan of reduction. It has a rounded shape.

f) Amorphous core: A core that does not fit any of the above categories and does not have a clearly definable shape.

g) Core fragment: A piece that has derived from an accidental break of a core.

h) Core on flake or flaked flake (Mc Nabb, 2007): A flake that has served as a core for the detachment of another flake.

3) <u>RETOUCHED OR FLAKE TOOLS</u>

a) Scraper: A flake retouched on either or both of its sides, or its distal part with usually scalar retouch. This retouch can sometimes be invasive or bifacial. This category includes all the scrapers described by Bordes (1961a).

b) Notch: A flake that exhibits at any part of its periphery a single or a retouched notch. It includes end notches (Bordes, 1961a)

c) Denticulate: A flake that exhibits retouch by contiguous notches (Bordes, 1961a).

d) Levallois point: A point produced by the Levallois method (Bordes, 1961a).

e) Mousterian point: Usually made on Levallois points, this type is distinguished by the significant amount of retouch applied on it (Bordes, 1961a).

f) Backed knife. A sharp flake that has been blunted opposite its sharp edge, usually by abrupt retouch to facilitate prehension (Bordes, 1961a).

4) <u>CORE TOOLS.</u>

a) Handaxe: A core that has been flaked on its both faces to produce a cutting edge in the greatest part of its circumference. This edge is often retouched. The handaxe typology usually followed in this thesis is the one proposed by Bordes (1961a). In special cases other definitions are used (see the discussion on Bout-Coupés in chapter 3).

b) Chopping tool: A core made on a pebble. The bifacial detachment of flakes has produced a sharp edge on one of its sides. The rest of this artefact is cortical.

In the second part of this chapter I presented an outline of the conceptual developments, concerning the subsistence patterns of Middle Palaeolithic hominids from the 1960’s to the present. It has become apparent through faunal and other laboratory studies, during the past fifteen years, that Neanderthals were top-level carnivores, subsisting mainly on big herbivores. In this context, information about possible group size, range size and energy requirements was examined to provide us with a heuristic framework, within which we can examine what a Neanderthal group might have been like, what was necessary for them to survive and finally in which ways and over what distances they moved, while leading their everyday lives. Keeping all this in mind, an attempt was made to understand the nature of the archaeological record of Neanderthals, by this meaning all the remains found at the places, where they spent part of their time. Through this effort, a typology of Western European Neanderthal sites was produced. Finally, a framework for the description of lithic assemblages in the case studies of the second part of this thesis was presented.

The diachronic and synchronic frameworks that were produced in this chapter are an attempt to combine ecological and anthropological approaches in the study of Neanderthal archaeology in Western Europe. They will be both applied in the case studies of the second part of this thesis and the results will be discussed.

CHAPTER 3: THE LATE MIDDLE PALAEOLITHIC OCCUPATION OF BRITAIN.

3.1. INTRODUCTION.

3.1.1. The history of research.

The beginnings of Middle Palaeolithic research in Britain cannot be viewed outside of the ideological context of the nineteenth century in Western Europe. It was the period when the idea of deep time was first proposed and established. The acceptance of this idea was significantly furthered by pioneer geologists of the period, like Sir Charles Lyell and Dr William Buckland, who read their papers before the gatherings of the Geological Society of London. As the idea of deep geological time became more accepted, more caves were explored with the purpose of collecting bone specimens from extinct animals to display in museums, or private collections. It was during these explorations that the admixture of *flint implements* with extinct fauna in caves was observed.

This association was well known by 1850, but it was after this period that new pioneers set forth to prove it beyond any reasonable doubt, by means of systematic excavation and scientific observation. Pengelly, in his first report before the British Association for the Advancement of Science, referring to previous explorations of Kent's Cavern, mentions that all the explorers before him had noted *flint implements* mixed with extinct fauna (Pengelly, 1865). What they had not done was to follow a systematic method in their explorations that would scientifically substantiate their observations. And this is what Pengelly set out to do. By following a meticulous method of recording stratigraphic associations and the vertical and horizontal positions of artefacts, he created a model for later excavations that was only surpassed in our times.

Other excavations of the time, like the ones by Dawkins and Mello in Creswell Crags (Dawkins, 1877, Dawkins, 1879) and Dawkins in Wookey Hole (Dawkins, 1863), followed the same pattern of recording stratigraphic associations, although the exact position of artefacts was not always recorded in an adequate way. An example, where lack of precision in the reports caused misunderstandings that lasted for about a hundred years, was Harrison's exploration of the site of Oldbury in Kent (Harrison, 1892). The initial name of the location, chosen for excavation, was used in the later reports, although the excavation was soon moved to a different location. It was only thanks to recent archive and curatorial work in the British museum that the actual provenance of the artefacts in the British Museum collection was established (Cook and Jacobi, 1998).

Lack of details in descriptions, mistakes in museum labelling, displacements of artefacts that were moved from museum to museum, even the partial destruction of collections by bombing during the Second World War (Harrison, 1977), have all contributed to a hazy view of the record of this period. Excavations that followed, during the first half of the twentieth century, were not reported in much more detail. A significant change can be noticed in the work performed from the 60's onwards. Unfortunately by that time, very little of the Late Middle Palaeolithic component of cave assemblages was left in situ. Excavations by McBurney and Clegg in Coygan Cave, in the south of Wales, during the 60's (Clegg, 1970) revealed only two handaxes, which together with another handaxe and two flakes from previous explorations comprise the whole of the Middle Palaeolithic assemblage of this cave (Aldhouse-Green, 1995). Even in this, relatively recent excavation, there is doubt about stratigraphic associations of features recorded in the cave.

Subsequent work in the 1970's and 1980's in Creswell Crags by Colcutt (Campbell, 1970, Campbell, 1977) and Jenkinson respectively (Jenkinson, 1984), managed to shed more light, mainly on the Upper Palaeolithic component of the assemblages. Extensive work on the identification of Middle Palaeolithic artefacts from old excavations in museum collections has been undertaken by Roger Jacobi. He has spent much of the past twenty-five years locating artefacts in museum collections, and correcting labelling mistakes, by making comparisons between museum and early excavation archives (Jacobi, 2006, Jacobi, In press). The identification of individual Middle Palaeolithic artefacts from 19th century excavations, used in this report, is largely based on his work. Parallel to that, in co-operation with other members of the Ancient Human Occupation of Britain research project (AHOB), they have identified and excavated undisturbed sediments, in previously excavated caves (Jacobi and Hawkes, 1993).

The only site, excavated recently and with modern methods, that can be safely placed in the Late Middle Palaeolithic occupation of Britain is Lynford in Norfolk. The excavation started in 2002 under the supervsion of Boismier, of the Norfolk

Archaeological Unit. Preliminary results were published one year later (Boismier et al., 2003). Scientists from a great range of disciplines have been studying the material since then, and a final publication is underway. It is hardly necessary to stress the importance of this site for the archaeology of a period, which has become very difficult to interpret, due to the problems mentioned above.

In terms of the type of assemblages constituting the archaeology of the period, it is believed that in Britain we are dealing with a local variant of the Mousterian of Acheulean Tradition (MTA). Assemblages comprise mostly of handaxes and scrapers (Roe, 1981). A peculiarity of the assemblages found in Britain in this period is the presence of a specific type of handaxe, known as *bout-coupé.* This type was first defined by Derek Roe, in his work, on the groups of British handaxes (Roe, 1968), and occurs in various dated and undated contexts. Roe (ibid, p. 18) describes the *bout coupé* handaxes as “very flat and refined” with usually “symmetrical convex sides and a blunt tip, with only a suggestion of point, often but not always tranchet finished”. Also “they are often broad” and their “cutting edge almost always runs round the implement’s circumference”.

The definition of this type by Roe was disputed by Coulson, who suggested that it was used as an umbrella term for more than one type of handaxe (Coulson, 1986). Furthermore, she proposed a stricter taxonomy, where the classic examples of *bout coupé* would be termed sub-rectangular, and the ones approximating Bordes’ biface types (1961a) would follow the classic Bordian typology. She concluded that this type of sub-rectangular handaxe was of limited distribution in Britain, and well below Roe’s estimation for a hundred find spots.

Tyldesley re-opened the issue (Tyldesley, 1987). She examined the largest part of the British sample of handaxes termed as *bout-coupé,* and came up with different results. She concluded that *bout-coupé* is a true type, and if some mistaken attributions are excluded, we are left with a sample of seventy-two occurrences of true *bout-coupé* handaxes in England and Wales. These handaxes constitute a uniform group. Tyldesley’s definition of the type consists of three basic features:

1. A symmetrical plan form with a rounded tip, slightly convex sides and a marked discontinuity of curvature at the intersection of the straight or slightly convex base with the sides.
2. High quality knapping, usually with soft-hammer, on each face, both tip and butt.

3. A refined profile.

The function of *bout-coupé* handaxes is as yet unknown (Tyldesley, 1987). White and Jacobi propose a possible symbolic significance of the artefact, for the maintenance of social networks of Neanderthals in Britain, during this period (White and Jacobi, 2002). My own views on the significance of this type, and whether it had a specific meaning for its makers, will be presented in the last part of this chapter, where I will attempt an overall interpretation of the British archaeological data. Today the *bout-coupé* is accepted as a true type, and it is believed to be a chronological marker for the period examined in this research (White and Jacobi, ibid). The dating information and my interpretations on the chronology of the period will be presented, in detail, in the next section.

3.1.2. The chronology of the sites.

In 1981 D.Roe placed the "British Mousterian proper", associated with the *bout coupé* handaxes, in the period around the end of the Ipswichian Interglacial and the beginning of the Devensian. Roe was working with a chronological framework that recognised only two climatic cycles after the Anglian (White and Jacobi, 2002). Twenty six years later, a very different picture has emerged, mainly due to the production of absolute dates with ever greater precision, from the eighties onwards and the Marine Isotope Stages sequence.

In the decade between 1986 and 1996 the picture had already started to change. U-series and ESR dating of speleothems (Proctor, 1994, Proctor, 1996) in Kent's Cavern (Figure 14, 5) produced a date of c.74,000 years ago as a *terminus post quem* for the formation of the cave earth that contains the Middle Palaeolithic archaeology. In Coygan Cave (Figure 14, 9), U-series dating of speleothems produced a date of c.64, 000 years ago (Aldhouse-Green *et al.*, 1995), as a *terminus post quem* for the Middle Palaeolithic archaeology. The archaeology itself was ^{14}C dated to 38-40 kyr ago (Aldhouse-Green *et al., ibid*). Similar dates (Allsworth-Jones, 1986) were obtained for the Middle Palaeolithic archaeology of Robin Hood's Cave, Creswell (Figure 14, 3). These dates obtained with conventional ^{14}C method close to its limits gave a minimum estimation for the age of the archaeology. A further date of 40,400+/-1600 (OxA-4782: (Hedges et al., 1996) was obtained by the use of AMS radiocarbon method on a cut-marked red-deer incisor, found in the cave earth in the site of Hyaena Den, Wookey (Figure 14, 6), while U-series dating of stalagmites from the nearby Rhinoceros Hole (Figure 14, 7) produced a *terminus post quem* of c. 50,000 years ago for the Middle Palaeolithic occupation there (Proctor et al., 1996). By 1996 it was obvious that the Last Glaciation occupation of Britain by Neanderthals was younger than originally thought, placed in the range of Marine Isotope Stages 4 and 3, with an attribution to MIS 3 being the likeliest.

During the following decade, it became possible to narrow down the actual timing of the Late Middle Palaeolithic occupation of Britain with greater precision. In 1998 the fauna associated with the Middle Palaeolithic archaeology from the Pin Hole Cave in Creswell Crags (Figure 14, 4) was radiometrically dated between 50 and 38 kyr ago (Jacobi et al., 1998). This type of fauna was already identified as a distinct assemblage, termed the Coygan fauna, which included spotted hyaena, woolly mammoth, horse, and woolly rhinoceros (Currant and Jacobi, 1997). It is found in all the cave sites, mentioned in the previous paragraph, but also in other sites, like Uphill Quarry Cave in Weston Super-Mare (Figure 14, 8), from which no absolute dates have been obtained so far.

In 2001 a whole sequence of mammal assemblages for the last part of the Pleistocene occupation of the British Isles was published (Currant and Jacobi, 2001). It included faunal assemblages from early MIS 5 down to late MIS 2. The Coygan fauna was now termed the Pin Hole Mammal Assemblage Zone, since the two sites contained identical faunas, but Pin Hole Cave was a site that still survived, contrary to Coygan Cave that had been destroyed by quarrying. The Pin Hole mammal assemblage zone was clearly related to MIS 3, and was associated with the return of hominids to Britain. It was distinguished from the preceding Banwell Bone Cave mammal assemblage zone, a less rich fauna, including reindeer and bison, which was associated with MIS 4, and was not related to hominid occupation.

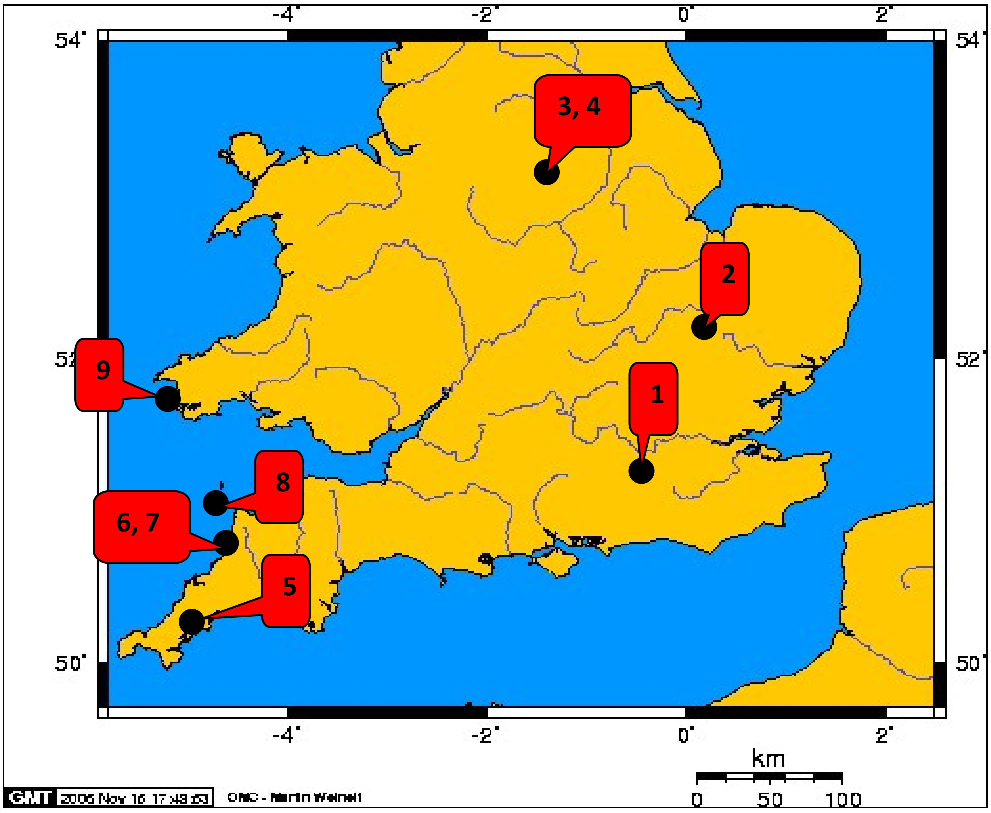


Figure 14: Map showing the location of some of the Late Middle Palaeolithic sites in Britain. 1: Oldbury, Kent, 2: Lynford, Norfolk, 3: Robin Hood Cave, Creswell, 4: Pin Hole Cave, Creswell, 5: Kent's Cavern, Torquay, 6: Hyena Den, Wookey, 7: Rhinoceros Hole, Wookey, 8: Uphill Quarry Cave 8, Weston Super-Mare, 9: Coygan Cave, Carmarthenshire, Wales.

The Banwell Bone Cave mammal assemblage shows a period of scarce animal population in Britain. This, seen in the context of the climatic curve of MIS 4 presented in chapter 2 (Figure 6), can be interpreted as a temporary re-population of Britain by few medium to large size herbivores, during the two relatively short milder episodes identified. It is possible that during the rest of MIS 4 Britain would have been a deserted barren land. Neanderthals do not seem to have followed these re-populations by animals, but neither did their favourite prey, woolly rhino and woolly mammoth, and this might be an adequate explanation. Also absent were other large carnivores, like spotted hyaena and cave lion. It would be reasonable to suggest that the big carnivores (Neanderthals, hyaenas, and lions), along with the big herbivores (woolly mammoth, woolly rhino) of the "mammoth steppe" constituted the inseparable elements of a tightly structured predator-prey landscape. In this context Neanderthal population movement to and from different regions could be associated with the expansion and retraction of the "mammoth steppe" element. Such a pattern has already been proposed by Ashton and Lewis (2002) for hominids occupying Britain after MIS 8/7. Modern African elephants tend to migrate very long distances (Sikes, 1971). If woolly mammoths followed the same patterns of migrations, we cannot rule out the possibility that initial re-population of Britain by Neanderthals, in MIS 3, occurred in the course of following such movements. This idea will be explored in more detail in the last part of this chapter, where the archaeology of Britain for this period will be interpreted as a whole.

In 2002 White and Jacobi published a new evaluation of the chronology of the occurrences of *bout coupé* handaxes in Britain. They examined the context of the specimens that were recognised as true *bout coupé* by Tyldesley (1987). It became clear that this type of handaxe is associated with MIS 3. This was more obvious in cave sites, where some absolute dates had already been obtained, and/or the archaeology was associated with the Pin Hole mammal assemblage zone. It was also shown that other occurrences in river deposits were quite often associated with some of the characteristic animals of MIS 3 Britain, and the river terrace associations often pointed to a wider Devensian or Middle Devensian chronology. Faunal associations of this type were also observed for some of the *bout coupé*, occurring in brick earth deposits. Brickearth deposits are basically loessic deposits. Loess was a kind of dust that was carried by winds and covered large areas of North-Western Europe, during the Devensian. The association with the MIS 3 fauna points again to a Middle Devensian chronology. The character of the lithic assemblages of the period was described as a type of MTA, where *bout coupé* coexisted with other cordiform/subtriangulate handaxes, and the use of Levallois was rare. Due to fact that the purpose of their paper was to establish a firm chronology for the archaeology of this period, White and Jacobi (ibid) excluded sites that could only be associated with it in terms of typology. One such site is Oldbury, in Kent (Figure 15, 1). The archaeology of this site is examined in the context of this thesis, and the reasons why it has to be included in this period will be presented in detail in the relevant section.

The chronological model devised by White and Jacobi (2002) was soon to be tested on a newly discovered site. In late February and early March of 2002 a new Middle Palaeolithic site came to light at Lyndford Quarry, Munford (Figure 15, 2) in the area of Norfolk (Boismier, *et al.*, 2003). The site contained an MTA type assemblage, including various types of handaxes, with some *bout coupé* amongst them, and was devoid of any sign of the use of Levallois technique. The archaeology was associated with fauna attributable to the Pin Hole Mammal assemblage zone, with the most abundant element being the woolly mammoth. Two OSL dates of 64,000 +/- 5,000 and 67,000 +/- 5,000 placed the deposition of the channel sediments where the archaeology was found, at the transition between MIS 4 and MIS 3 (Boismier, ibid). Further dating by A.J. Stuart and A.M. Lister on woolly mammoth using AMS- ^{14}C produced dates 53,700 +/-3,100 BP (OxA-11751) and >49,700 BP (OxA-11572), indicating an age for the site in excess of 50,000 yr (Schreve, 2006).

Finally the most recent dating program undertaken in the context of the Late Middle Palaeolithic occupation of Britain was a collaboration of the Department of Prehistory and Europe of the British Museum and the Oxford Radiocarbon Accelerator Unit (Jacobi et al., 2006). The dating was applied on bones from Pin Hole Cave, Robin Hood Cave, and Hyaena Den, with the purpose of refining the chronology of Middle and Upper Palaeolithic assemblages in Britain. The method used was AMS ^{14}C, with previous removal of contamination from bones, achieved with ultrafiltration of bone gelatine. Following this new approach, the results showed finite dates in the range between c. 54,000 and 40,000 years ago (Jacobi *et al, ibid,* Tables, 1, 2 and 3). Jacobi *et al.* state that the dates were not calibrated formally, due to the problems with ^{14}C calibration in this period, mentioned in chapter 2 of this report. They mention though that when they compared the radiocarbon determinations from the three Late Middle Palaeolithic sites with the Cariaco basin record (Hughen *et al.,* 2004) the tentatively corrected results were close to those obtained by TL and ESR dating in the MTA levels of the lower shelter of Le Moustier in Dordogne, which are known to be in the range between c. 40 and 55 kyr ago (Valladas et al., 1986, Mellars and Grün, 1991).

It has been made apparent in this section that the Late Middle Palaeolithic occupation of Britain dates to MIS 3, and specifically its first part between 60 and 40 kyr ago. The place of individual sites on this timescale and the possible relation of their occupation with identified “mild episodes” on the NGRIP climatic curve will be discussed for each of the sites, in the following sections. For those sites that are dated with ^{14}C the CalPal2007$_{HULU}$ curve will be used for calibrations.

3.2. The archaeology of the sites.

3.2.1. Lynford Quarry in Munford, Norfolk.

Lynford Quarry is situated in southwest Norfolk, 2km north-east of the village Munford and south of the river Wissey. During quarrying in 2002 Middle Devensian fauna and archaeology were revealed and the excavation took place between April and September of the same year. The archaeology and fauna occurred in a palaeo-channel with a dark organic fill. The part of the palaeochannel excavated represented a former meander cut-off; it was 21 m long by 12 m wide. The fossiliferous sediments attained a maximum thickness of 0.70 m and were located in dark brown to brown organic matter, with silt and very fine sand deposited under still water, or very low energy water conditions. This sediment was sandwiched between gravel deposits (Boismier *et al.*, 2003).

The palaeobiological datasets, comprising of pollen, plant macrofossils, beetles, molluscs, and vertebrates, indicate an open environment dominated by grasses, sedges, and low growing herbaceous communities with small stands of birch or scrub, acid heath or wetlands adjacent to a source of permanent water. OSL dating of the deposits from within the palaeochannel indicate a chronological position of the site in the transition between MIS 4 and 3, c.60, 000 years ago. A younger channel, which truncates the archaeology bearing channel at a higher level, has also been dated with OSL to c.55, 000 years ago (Boismier, *et al.*, *ibid*). Both the TL and the OSL methods produce calendrical (real years) ages. This provides a space of 5,000 years, during which the occupation in Lynford must have occurred, namely between 60 and 55 kyr ago. Such a chronological classification is corroborated by two dates on mammoth bone obtained from within the archaeology deposits. One of these was a finite date of 53700+/- 3100 years ago. I attempted to calibrate this date with CalPal2007$_{\mathrm{HULU}}$, but due to its proximity to the limits of this method, the results were not reliable and will not be used here. The dating of the bones occurred as part of a program of radiocarbon dating of extinct Eurasian megafauna by A.J. Stewart and A.M. Lister, and both together showed a dating in excess of 50,000 uncalibrated years ago (Schreve, 2006).

The mammal assemblage is consistent with the Pin Hole Mammal assemblage zone, characteristic of MIS 3 (Currant and Jacobi, 2001), consisting of wolf, red fox, brown bear, spotted hyaena, woolly mammoth, horse, woolly rhinoceros, reindeer, and bison. The most abundant species is mammoth, comprising 91.3% of the total assemblage. Schreve's taphonomic study of the fauna (*ibid)* showed that it was incorporated in the channel sediments in different episodes creating a palimpsest. Most of the bones seem to have been exposed in the surface from 4 to 15 years, before they were buried in the channel mud, and these are minimum estimates. There is only minimal evidence for fluvial deposition of a very small part of the assemblage, so we have to assume that the greatest part of the assemblage is in primary context. The great degree of fragmentation witnessed in most of the bones is interpreted as a result of trampling of the sediments by big herbivores coming to the water source to drink.

The effect of carnivore damage on the bones is minimal and it indicates only marginal carnivore contribution to the accumulation of the assemblage, with the most characteristic case being the identification of gnawing marks of hyaenas on juvenile mammoth and rhino bones. From the 1345 specimens identified to species, genus, or family level only 67 specimens showed carnivore interference. From these 43 specimens were on mammoth bone, eight specimens on reindeer, two on woolly rhino and one on horse. Wolf, hyaena, bear, and fox are represented at the site by one individual each.

The evidence for modification of bones by Neanderthals in the form of spiral fractures made, when the bones were fresh, was even less, and was identified on 14 bones of woolly rhinoceros and one of reindeer. No unequivocal evidence for cut-marks, or spiral fractures has been identified on the mammoth bones. The trampling of sediments has created in many cases bone damage that is not possible to distinguish from actual human modification. Schreve (2006) suggests that the lack of evidence for human modification on mammoth bones should not be taken at face value. It is possible that due to the thickness of the hide and flesh of mammoths, the stone tools would have rarely made contact with the actual surface of the bones. She also refers to the study of past and modern elephant butchery (Haynes, 2002). Haynes noted that in modern elephant butchery experiments, experienced butchers never left marks on the post-cranial bones.

The hypothesis that mammoths were actually killed by Neanderthals is consistent with the mortality pattern evidenced in the assemblage (Shreve, *ibid*). Contrary to an expected natural death composition of an elephant group that would include adult females and juveniles, the assemblage comprises mainly of young adult males and prime adult males. This could be taken to indicate a selective targeting of prime age individuals by mammoth hunters. Moreover, a great deal of evidence of pathologies has been identified on the mammoth skeletons, and especially in the areas of ribs and vertebrae, by Professor Don Brothwell of the University of York. These could be associated with injuries, resulting from hunting. Shreve (2006) proposes a targeting by Neanderthals of previously injured mammoths that could have ended in the Lynford water source to soothe their injuries. Neanderthals could have taken advantage of the marshy environment, leading mammoths into traps making killing an easier task. Finally the interpretation of Lynford as a kill site is further supported by the fact that long bones are generally absent in the assemblage. This could indicate a preferential transport of the meatier parts of the carcasses elsewhere by Neanderthals.

The interpretation of Lynford as a mammoth hunting site has recently been disputed by Smith, who examined the faunal assemblage in the course of his PhD thesis (Smith, 2008). He identified some evidence for human modification on bones, mainly marrow processing, but he maintains that these are mainly associated not as much with mammoth as with other species. In any case, whether Neanderthals hunted mammoths or other species at the site does not seem to change the character of the site very much. It seems that near this water source, there were opportunities for the acquisition of meat and Neanderthals took these opportunities at various points in time.

The artefact assemblage comprises of 2700 specimens, which have been studied by Mark White of the University of Durham. His detailed study is currently under publication, but a general description of the assemblage exists in the interim statement of the site (Boismier *et al.*, 2003). The whole of the assemblage is made on good quality flint. No specific location for the provenance of the material has been reported yet, but it is known that good quality flint is abundant in this area. Most artefacts are in a mint/near mint condition indicating a primary position for the assemblage. Edge damage is witnessed on individual artefacts and this could be related to animal trampling of the sediments. Patination is generally absent and this indicates that the artefacts were not exposed on the surface for long periods of time.

Typologically the assemblage is characterised as Mousterian of Acheulean Tradition (MTA). It is mainly composed of handaxes, flakes and micro-debitage, with much lower proportions of cores and flake-tools. Forty-seven handaxes occur, including pointed, cordiform, sub-cordiform, ovate, and bout-coupé types. The flake tools comprise of only ten specimens including scrapers, notches and denticulates. The few cores present are single platform, bipolar and discoidal. There is no evidence for the use of Levallois technique. The study of unretouched flakes shows that no primary knapping occurred on the site. The micro-debitage is mainly associated with the manufacture of handaxes. A quartzite hammerstone and a sandstone anvil, the latter possibly used for bone or wood processing, were also recovered. The lithic artefacts occur in a number of chronologically discrete deposits, which points to repeated visits of the site by Neanderthals, resulting in a palimpsest of occupations.

The lithic evidence, taken in conjunction with the faunal evidence, provides a good insight into the occupation of the site. The site was repeatedly visited by various agents, including herbivores, Neanderthals, and other carnivores. The Neanderthal visits could have been mainly related to the acquisition of mammoth meat, as shown by the great numbers of mammoth bones in the assemblage and the absence of long bones, which were then carried elsewhere after the kill. Of course, this does not rule out the possibility that other smaller herbivores were also killed there. The fact that primary knapping is absent on the site indicates that Neanderthals arrived there already geared up with pre-knapped cores, blanks or even readymade tools for use on the spot. Debitage from handaxe manufacture could be related to the final shaping of these tools from previously processed cores and blanks, and their maintenance (repair/re-resharpening), while butchering activities took place in the vicinity of the Lynford water source. It seems that Neanderthals were also after their second favourite prey, woolly rhino, when visiting the area, but opportunistic killing of reindeer occurred as well, possibly in times when this prey was too easily accessible to be ignored.

In terms of the environmental model proposed in chapter 3 with Neanderthals occupying Britain during the peaks of the MIS 3 “mild episodes”, the following inferences can be made. It is clear that the site was occupied in the period between 60 and 55 kyr ago. Figure 15 is a graph showing the mild episodes in this specific period, based on the NGRIP data. It is impossible to tell with any certainty, in which of these episodes the occupation in Lynford occurred. The most significant “mild episode” in terms of intensity combined with duration is situated between 59 and 58 kyr ago. It seems likely that the occupation of Neanderthals would have happened in one of the warmest episodes and possibly the one with the greatest duration. The duration of the amelioration period is important, because it takes some time before the effect of climatic change is visible in the environment (see chapter 2, figure 4). For this reason it seems to me that occupation during this “mild episode” is more likely.

Figure 16 examines this “mild episode” in greater detail. The climatic amelioration starts at around 58,850 years ago and ends at around 58,100 years ago. The highest oxygen value attained is -38.41. This gives us a period of 750 years of relatively milder but unstable climate. If my approach to Neanderthal responses to climatic stress is valid, then we should consider the possibility that repeated occupations of Lynford happened somewhere in the course of these 750 years and preferably during one of its warmest peaks. The latter seem to occur about every 200 years, reducing in intensity through time.

As far as the site typology proposed in chapter 2 of this report is concerned, Lynford clearly belongs to the category b) of the butchery/kill site. The location of the site in the immediate vicinity of a water source, where herbivores would have gathered to drink, makes it an ideal hunting spot. The fact that Neanderthals arrived there with a readymade toolkit to use on the spot does not leave much doubt about their good knowledge of the landscape and the intentionality of their actions.

It may also indicate that somewhere in the surrounding area sites of type a), namely rest/recreational/observation sites, as described in the previous chapter are to be found. I would expect that the toolkit found in Lynford would have been prepared in sites of type a), where Neanderthals would have observed animal movements and bonded as a group before embarking on the very dangerous hunt. It may also be reasonable to expect that at least some of these sites would be situated in strategic spots possibly overlooking surrounding areas, or near river valleys, which could have been corridors for animal movement.

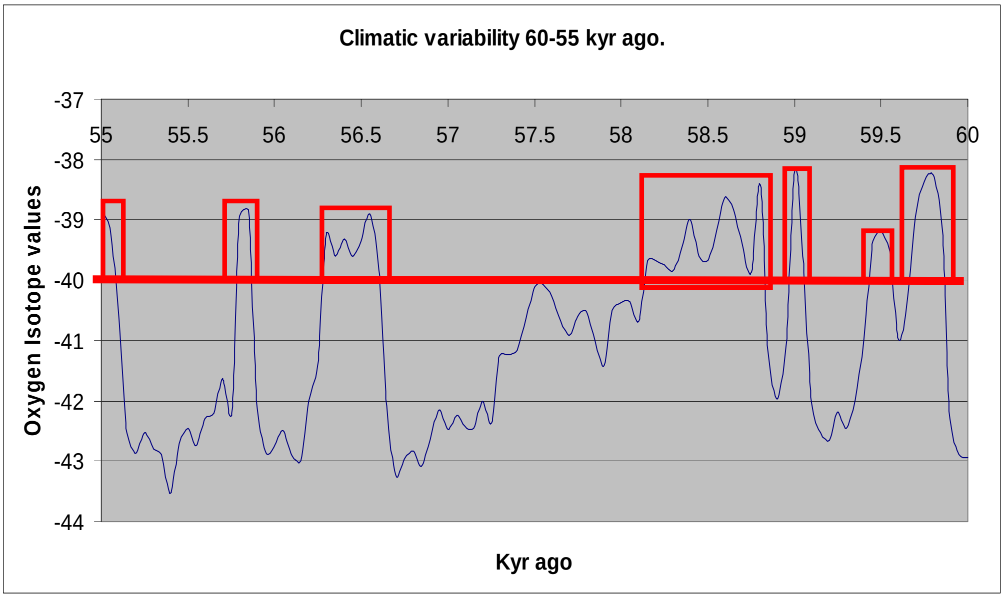


Figure 15: Graph showing climatic oscillations between 60 and 55 kyr ago. The red line indicates the oxygen value threshold for a "mild episode" to occur. The "mild episodes" in this period are indicated with red boxes. Data from NGRIP 2004, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

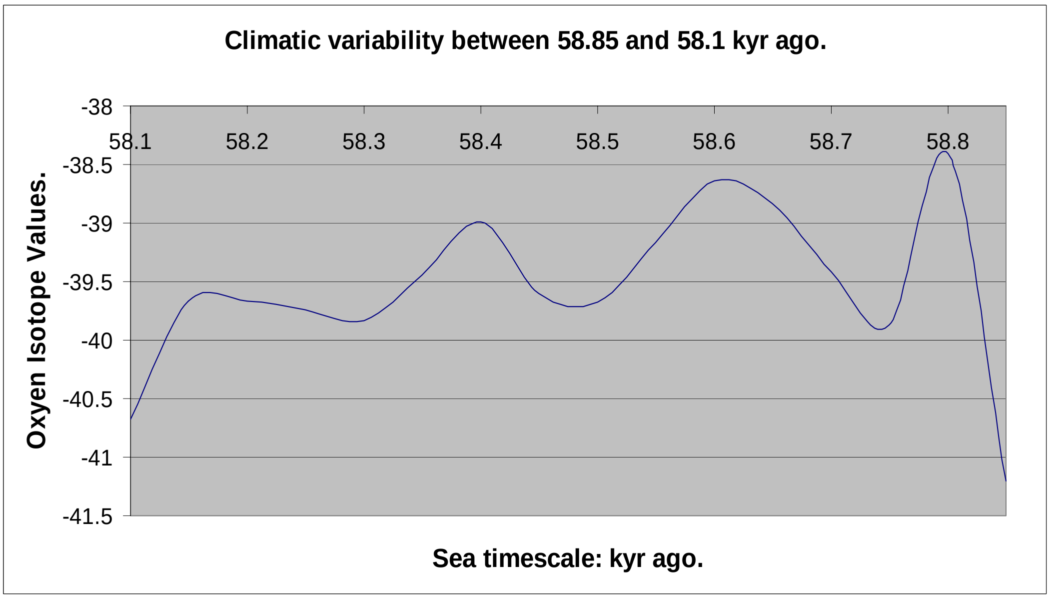


Figure 16: The "mild episode" between 58.85 and 58.1 kyr ago in detail. Data from NGRIP 2004, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

The hint that Neanderthals were transporting meat elsewhere may mean that there are more sites to be discovered in this area, sites that will possibly belong to category c), described in chapter 2 as food consumption/resources processing sites. These are the places to where Neanderthals would have carried meat and possibly spent short periods of time, four to eleven days, as proposed in chapter 2. There they would subsist on this meat, before embarking on new explorations. I mentioned in chapter 2 that caves would be ideal for this kind of habitation. Due to the fact though that no limestone karstic formations exist in the area of East Anglia, the second best choice would have been areas which would offer at least partial protection from the elements, such as patches of tree vegetation. It is possible that such patches existed in the surrounding area of Lynford, although the environment was largely open. Such sites should definitely be associated with the presence of fire that would keep other carnivores away from the meat stash. The fact that fire is absent at the Lynford kill site, indicates the short duration of Neanderthal visits, which would probably never have lasted more than part of a day. This should be expected for the butchery/kill sites of category b). All these movements from site to site should be expected to have occurred within a maximum radius of 16 km around the site, as shown in the previous chapter. This hypothetical circular area with a diameter of 32 km around the site would be a good start in the search of sites of other types with which Lynford might have been related.

Lynford is a unique site for this period in Britain. It is the only modern excavation and subsequently the only site that provides detailed information about Neanderthal life in this period. Furthermore the occurrence of the assemblage in primary context, in sediments occurring in still water is unique. Lynford is the only open air site in Britain with absolute dating for this period. In this sense Lynford is a flagship site within the Late Middle Palaeolithic of Britain. It is a rare chance to see the record of this period with minimal bias. Lynford is also an indication of the limits of the data resolution from this period in Britain.

3.2.2. Pin Hole Cave, Creswell Crags, Derbyshire

Pin Hole cave is located in the Creswell gorge, in the East Midlands. Creswell gorge is a shallow incision in the Permian Lower Magnesian limestone on the border between Derbyshire and Nottinghamshire, with a length of approximately 450 m. It has an orientation of West to East. Originally, the gorge contained a river, which today has been transformed to an artificial lake. Pin Hole is one of several solutional fissures in the limestone of Creswell that have produced Late Middle Palaeolithic archaeology. It is situated in the western end of the northern side of the gorge (Jacobi, 2006). The cave was apparently named after a 19th century custom of visitors putting pins in the cave wall fissures (Mello, 1876).

There have been several excavations in the cave starting in 19th century and reaching the 1980's. The first exploration by Mello and Heath started in 1875 and after two seasons of animal fossil discoveries near the entrance, the cave was abandoned, and the exploring committee turned its attention to the nearby Robin Hood Cave (Mello, 1876). Only one Middle Palaeolithic scraper was recovered during this excavation (Jacobi, 2006). The cave was more systematically excavated during the 1920's and 1930's by Armstrong and the material discussed here mainly derives from these excavations (Armstrong, 1926, Armstrong, 1932, Armstrong, 1939). Further excavations were conducted by Collcutt, with the purpose of clarifying the stratigraphy of the Creswell Caves (Colcutt, 1975). The last excavation to take place in the cave was by Jenkinson in the 1980's (Jenkinson, 1984).

The cave is a long and narrow fissure around 46 m long, with two relatively wider sections, one about 12 meters from the modern entrance and one towards the rear of the cave about 25 m from the entrance, named by Armstrong the "outer chamber" and "inner chamber" respectively. He named the area between these two chambers the "passage". From the "inner chamber" starts another short passage turning eastwards, which he named the "east passage". This leads to another wider area, named the "trefoil shaped chamber" (Figure, 17). Armstrong excavated the area between the entrance and the rear of the cave to a total length of 24.6 m. He also extended his exploration to the "eastern passage", and the "trefoil shaped chamber" (Jacobi, *et al,* 1998). The Late Middle Palaeolithic archaeology, surviving today, comes from the main part of the cave, meaning the entrance, the "outer" and "inner" chambers and the "passage". The cave was excavated in sections, but their boundaries were not consistently recorded, so this classification is not of great use today.

In terms of stratigraphy Armstrong observed two main Pleistocene sediments, an upper red cave earth and a lower yellow cave earth. The latter was locally underlain by coarse water-laid red sand. Above the Pleistocene sediments there was a breccia of Holocene age. A recent re-plotting of the artefacts from the Armstrong excavations (Jacobi *et al.,* 1998) showed that the Middle Palaeolithic archaeology was mainly found in the Lower Cave Earth (yellow), while the Early and Late Upper Palaeolithic were found in the Upper Cave Earth (red). There was only a small overlap of Middle and Early Upper Palaeolithic archaeology at the boundary of these two sediments (Jacobi et *al.,* 1998, Jacobi, 2006). The cave earth was introduced from an aven in the roof at the back of the cave, but the artefacts are in a generally mint condition (pers. obs.), with no clear signs of transport damage and are likely to be in situ. It is certain that the introduction of the sediment caused some movements of the artefacts within the cave and some re-working of sediments, but there is no clear indication that the artefacts were introduced from outside. The two cave earths total in thickness about 5 meters with the Lower Cave Earth being the thickest. The Middle Palaeolithic archaeology does not occur in a discrete horizon within the lower cave earth, but it is distributed throughout its thickness. It is impossible to say if the occupation occurred during a series of separate episodes, or if it happened in a single episode, and then the archaeology was re-worked throughout the whole of the sediment (Jacobi, 2006). Recent dating of bones in the yellow cave earth with AMS radiocarbon technique suggests a calibrated age for the Middle Palaeolithic occupation between 55 and 40 kyr ago (Jacobi, et *al.,* 2006).

The fauna from the yellow cave earth is typical for MIS 3 Britain, including wolf, red fox, brown bear, and spotted hyaena, woolly mammoth, horse, woolly rhinoceros, reindeer, and bison. A taphonomic study of the assemblage reveals that few animal bones are without carnivore damage, as evidence of gnawing marks and digestion from hyaenas show. Bones from perinatal hyaenas indicate the existence of a hyaena den, at some point in time, in the area of the east passage and the trefoil chamber. No cut marks have been identified, but Jacobi *et al.* (1998) suggest that even if these existed they may be invisible now, due to the overprinting of hyaena activity.

Artefacts from Pin Hole are to be found in Derby Museum and Art Gallery, Manchester University Museum, Sheffield City Museum, and the British Museum. A report of the non- flint Middle Palaeolithic artefacts from the cave has been recently published by Jacobi (2006), including a table with a summary of the artefacts made on flint. A total of 56 artefacts are mentioned, made on flint, quartzite, and clay ironstone. Only one of them was made on the latter material, a handaxe retouch flake. This is apparently the total of the assemblage that was excavated from the yellow cave earth.

I examined the greatest part of this assemblage, namely the artefacts available, in the collections at the Manchester University Museum and the British Museum, while for the rest I used the information published by Jacobi (*ibid*). In the sample I examined, I used Armstrong's notes as an indication of artefact provenance, and the presence of yellow cave earth adhering on them, in the cases when the latter was visible. The total number of the artefacts studied is 39. The clay ironstone piece mentioned above was not part of the collections I examined, so the following statistics include only flint and quartzite. Flint seems to have been used slightly more than quartzite, with 56.4 % of the artefacts made on this material (Table 4). This pattern of relative flint predominance holds true also in Jacobi's (2006) examination of the whole assemblage. It is possible to identify two different types of flint. The first is the type Jacobi (*ibid*) refers to as "Wolds flint", and possibly originates in Lincolnshire. The other is a translucent flint, and its origins are essentially unknown. Both types seem to be of very good quality.

”Wolds flint” comes in two colours grey and brown, with grey being the most common occurrence. Part of the flint component of the assemblage cannot be attributed to any of the categories, due to heavy patination (Figure 18).

Differentiations can be observed within the quartzite element of the assemblage as well. Most of the artefacts are made on brown quartzite, but quartzite of different colours was also used, ranging from grey and green, to green with pink spots (Figure 19). All different types of quartzite belong to the same fine-grain quality, with good flaking properties. In this sense the predominance of brown coloured material could be attributed either to its greater availability, or a colour preference. For both flint and quartzite, where cortex was preserved it was most of the time of an alluvial nature, indicating the use of river cobbles and pebbles (Figures 20 and 21).

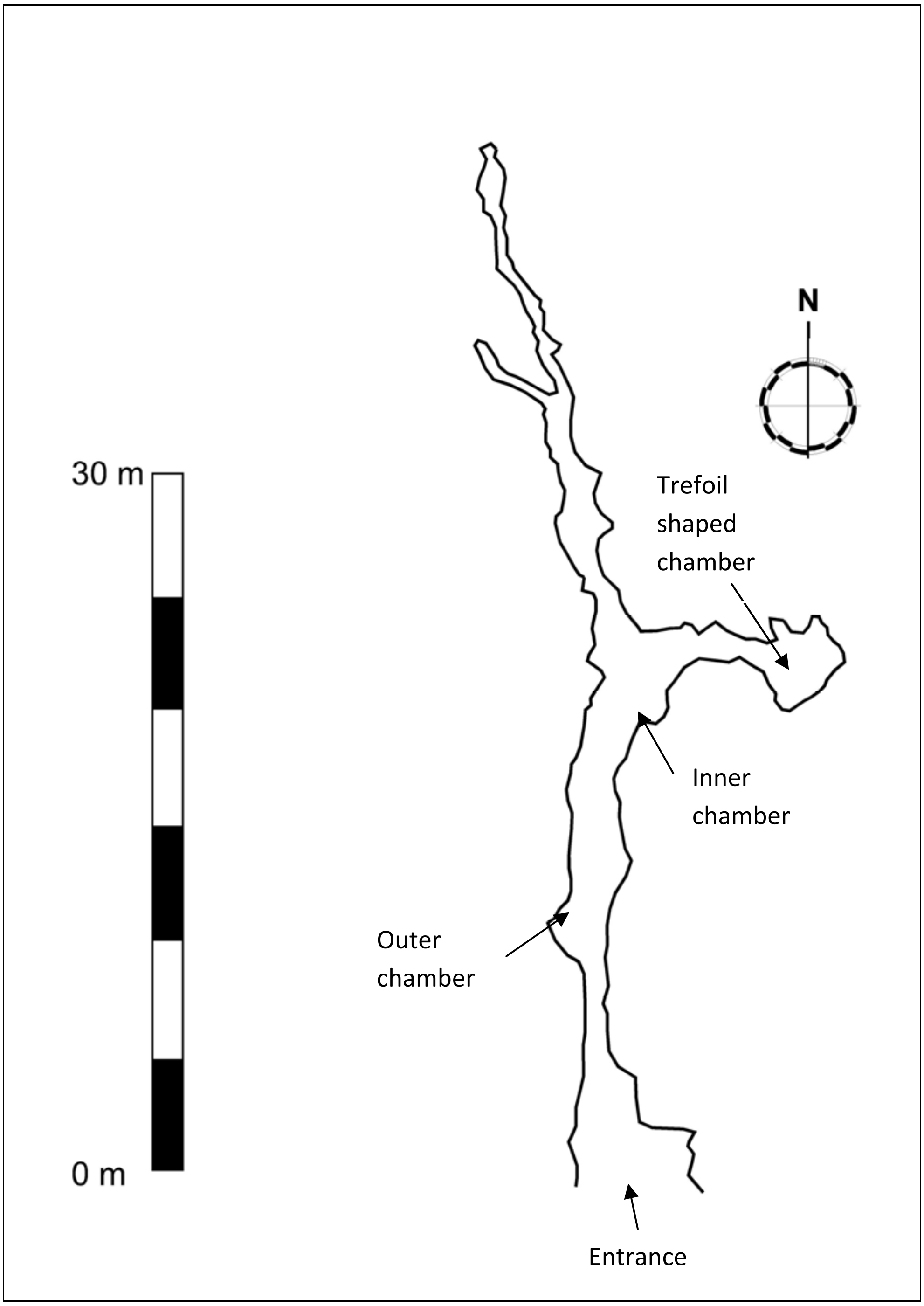


Figure 17: Ground plan of Pin Hole Cave with Armstrong's terminology for its different parts. Redrawn by Aggeliki Zacharia and Babis Garefalakis.

Raw materials	Frequency	Percent
Flint	22	56.4
Quartzite	17	43.6
Total	39	100

Table 4: Frequencies of raw materials used in the yellow cave earth in Pin Hole (pers. obs.).

The fact that all types of flint and quartzite used at the site seem to derive from river pebbles or cobbles, points to an exploitation of local resources. It is known that quartzite occurs locally in the area and its most likely source is the “Bunter” pebble beds of the Triassic (Jacobi, 2006). Apart from the quartzite artefacts, a few unmodified quartzite cobbles and one quartzite cobble, used as a hammerstone have been found within the yellow cave earth. Flint is not strictly local. The closest deposits containing flint are in the area of Lincolnshire. It is possible though that when Neanderthals occupied Creswell Crags, flint present in pre-Devensian tills was available in the wider area in pebble form. Clay ironstone is known to have been used in the 19th century in the iron industries of Clay Cross, Renishaw, and Sheffield. Nodules of this material could have been picked up, during the Palaeolithic, from soils in the exposed coalfield or as erratics derived from the Coal Measures (R. Firman pers. comm. to Roger Jacobi, in Jacobi, 2006). This means that clay ironstone would be available within a c. 30 km distance from the cave. This distance is well beyond the maximum range of 16 km specified in chapter 2 and it is possible that this material indicates communication with other groups further away from Creswell Crags.

An important difference between flint and quartzite can be observed in the percentage of cortical versus non cortical artefacts. About 70% of the flint artefacts did not preserve any cortex on their surface, while only 12% of the quartzite artefacts were non-cortical (Figures 20 and 21). This indicates a lack of primary knapping of flint at the site. It is possible that the source of flint was not in the immediate vicinity of the site, and hence pieces of flint knapped at Pin Hole were already decorticated before they arrived at the site. Another interpretation could be that only modification of already shaped flint artefacts was taking place at Pin Hole. Quartzite, on the other hand, seems to have been picked up locally and the predominance of cortical pieces points to a less intensive exploitation of this material.

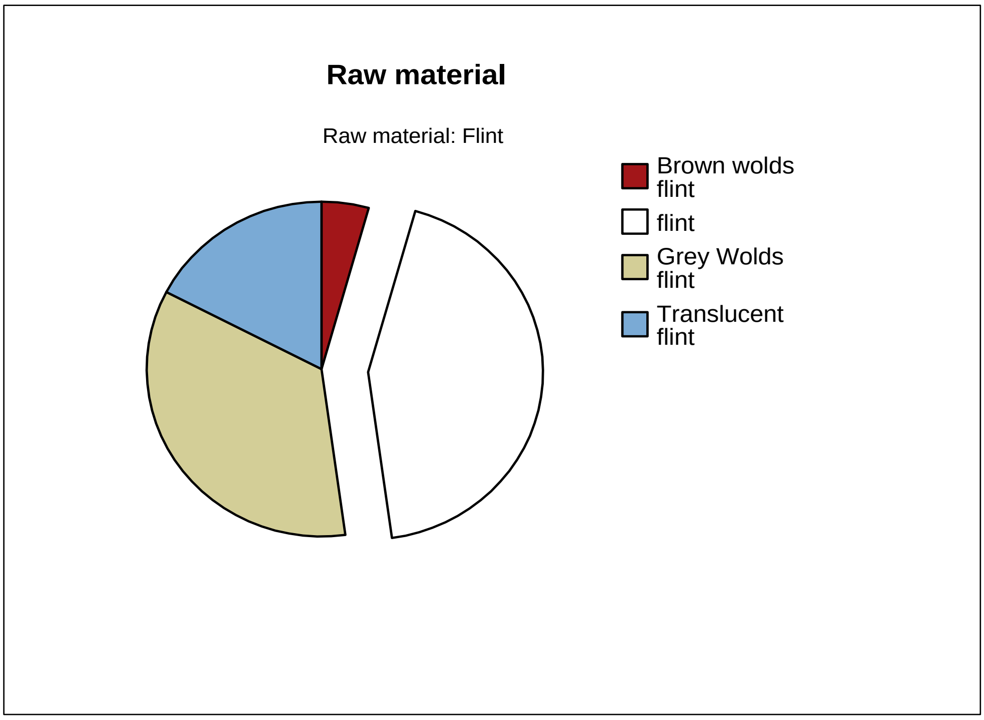


Figure 18: Differrentiations within the flint category, in the Pin Hole assemblage. The white pie-slice refers to the pieces that could not be identified, due to patination (pers. obs.).

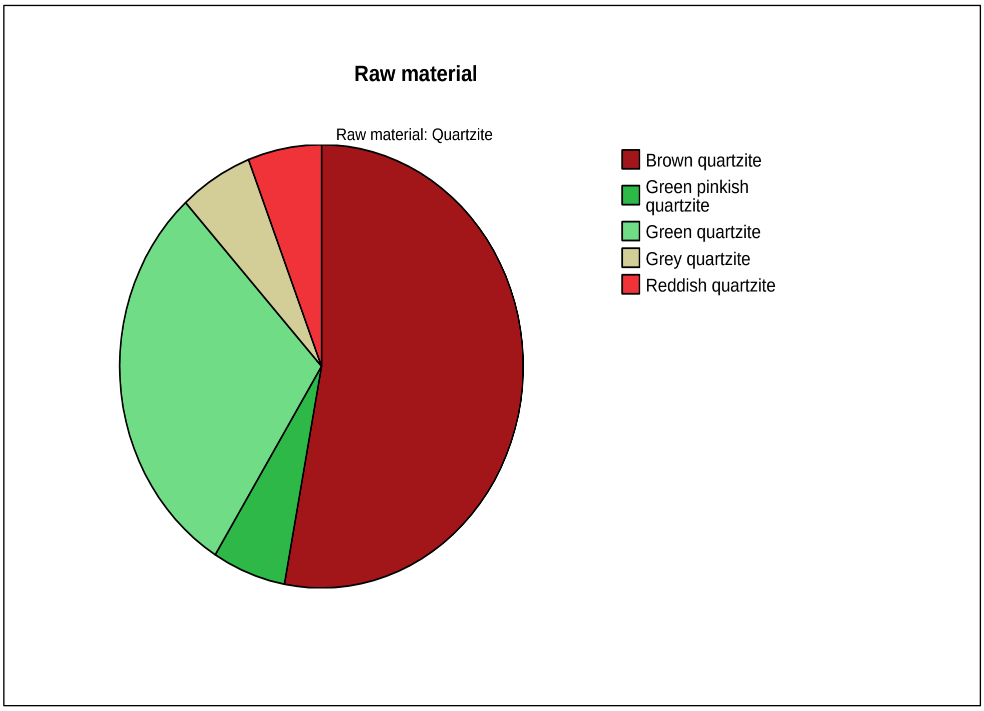


Figure 19: Differentiation within the quartzite part of the Pin Hole assemblage (pers.obs.)

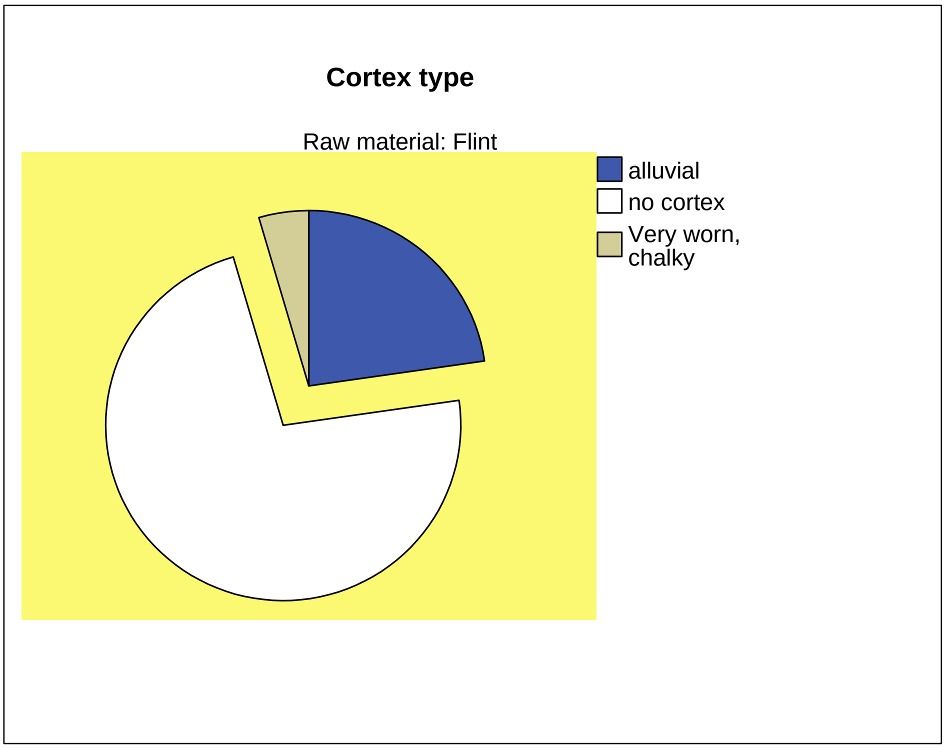


Figure 20: Cortex type in flint artefacts from Pin Hole. The white pie-slice indicates the non-cortical artefacts. (pers. obs.).

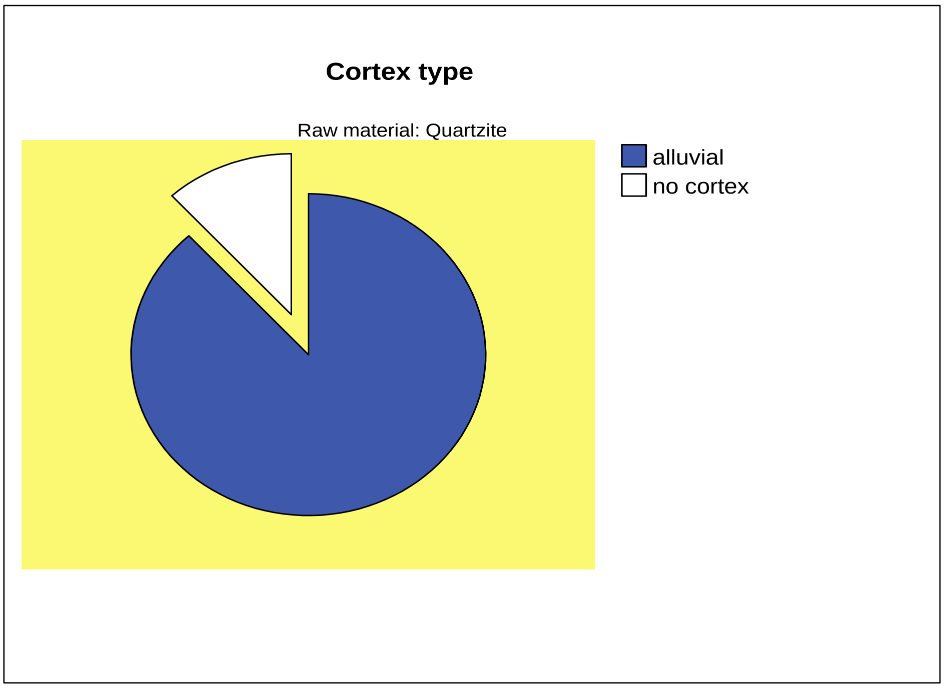


Figure 21: Type of cortex recorded in quatzite artefacts from Pin Hole. The white pie-slice represents the non-cortical artefacts (pers.obs.).

A crosstabulation of artefact types and raw materials is presented in table 5. There are no real differences between the strategies employed on the two materials. Retouched pieces occur on both flint and quartzite. There is evidence for *in situ* retouching on flint, in the form of a retouch spall, and evidence for re-sharpening of retouched artefacts on quartzite, in the form of a sharpening flake from a scraper. Debitage is evidenced in both materials and in both cases there are indications of the use of discoidal technique in the form of chordal flakes. The one hammerstone found is on quartzite, which is expected, due to the durability of the material. Also traces of former use as hammerstones can be seen on the cortical backs of some of the quartzite flakes in the assemblage.

However, there were no handaxe manufacture/maintenance flakes on quartzite in my sample. Jacobi (2006), who studied the whole of the assemblage, identified two or three such flakes on this material. In terms of presence and absence of handaxes, the only handaxe found in the yellow cave earth is made on quartzite, but there is no refitting evidence to connect it to the handaxe manufacture flakes identified by Jacobi (*ibid).* In the case of flint, only flakes from handaxe manufacture/maintenance are found, but not the handaxes themselves. The single handaxe retouching flake on clay ironstone points to a handaxe of this material being carried in the cave and then being repaired, before being transported elsewhere.

In general, it seems that handaxes are either made or repaired in the cave, but they are carried and used elsewhere (flint, quartzite). Then at times they are brought back and maintained before they are carried away again to be used and discarded in other places (flint, quartzite, and clay ironstone). There is one exception, the partial handaxe on quartzite. This latter piece, which is not worked over its whole surface, and lacks retouch on the formed edge (Figure 22), could be possibly related to a failed attempt to make a handaxe on quartzite that was then abandoned on site.

Artefact type	**Raw material**		
	Flint	**Quartzite**	**Total**
Broken retouched	1	0	1

piece			
Chordal flake	2	3	5
Core edge removal	1	0	1
Flake	4	4	8
Flake fragment	3	1	4
Flake shatter	2	0	2
Hammerstone	0	1	0
Handaxe maintenance piece	3	0	3
Handaxe manufacture piece	4	0	4
Partial handaxe	0	1	1
Pebble core	0	2	2
Retouched tool maintenance piece	0	1	1
Scraper	1	4	5
Scraper retouching piece	1	0	1
Total	**22**	**17**	**39**

Table 5: Crosstabulation of artefact types and raw materials in the yellow cave earth of Pin Hole. (pers. obs.).

From the above it can be inferred that Neanderthals reached Pin Hole carrying flint in form of partially decorticated pieces or finished artefacts from some distance away, and handaxes on clay ironstone. While at the site, they made complementary but not very intensive use of quartzite to serve the same purposes as flint.

A summary of the activities performed at the cave, as can be inferred from the artefacts is given in figure 23. The presence of retouched tools is taken here to indicate the use of these tools in the cave, where they were supposedly discarded after use. The most common activity is the production of debitage, followed by the making and maintenance of handaxes. By the term “production of debitage”, I refer to the production of unretouched flakes, whether these were the intention of the knapper or occurred as waste. The use of retouched tools comes third and the least common activity is the making and maintenance of retouched tools.

Figure 22: Partial handaxe on brown quartzite from the yellow cave earth in Pin Hole. Photo by Babis Garefalakis. Used with the kind permission of the Manchester University Museum.

The activities performed in Pin Hole are consistent with an attribution of this site to the type c) of my site typology, referring to food consumption/resources processing sites. The making and maintenance of handaxes that are used elsewhere, indicates that primary, heavy duty butchery took place away from the site. The predominance of debitage in the form of sharp flakes can be consistent with light-duty butchering activities. These would occur in the sites of type c), if my assumption of meat being consistently carried away from butchery sites is correct. The quartzite flakes with their cortical backs that would have given a good grip would be ideal for this kind of operation. These would have been produced by the use of discoidal technique on river cobbles. The making, use and re-sharpening of scrapers on site can be related to the processing of hides or wood for the making of spears. I have mentioned before that due to the duration of occupation in sites of type c) and the storage of meat for several days, evidence for fire to keep away carnivores should be anticipated in these sites. In Pin Hole two pieces of carbonised bone are reported to have been recovered in the yellow cave earth (Jacobi, 2006), so there may be evidence for the use of fire in the cave.

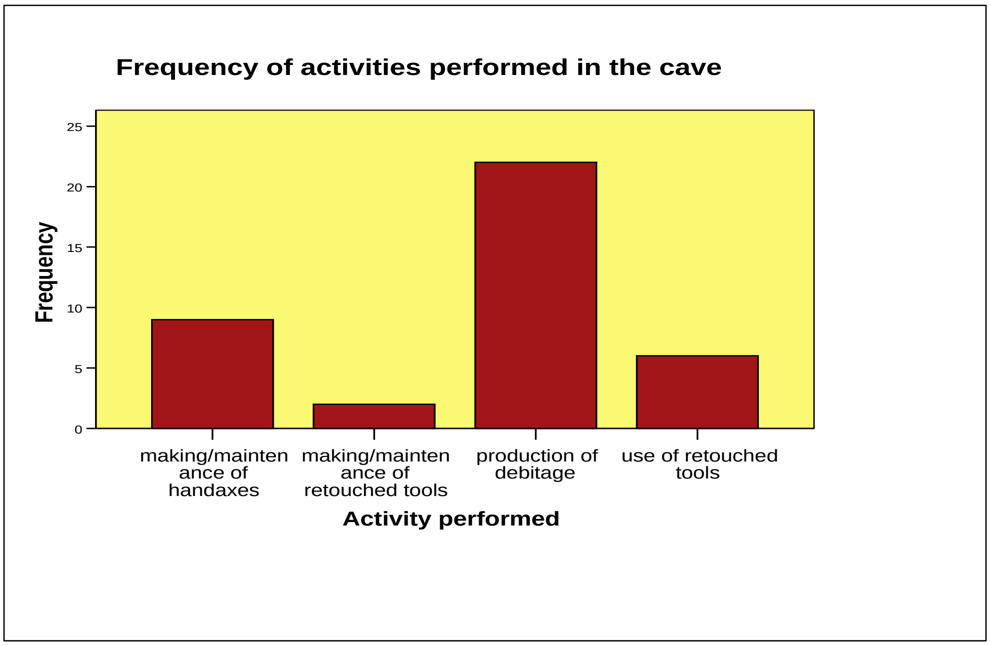


Figure 23: Frequency of activities performed in the Pin Hole cave (Pers. obs.).

In terms of attribution of the Pin Hole lithic assemblage to a specific climatic episode within MIS 3, the following observations can be made. As mentioned in the chronology section above, the Middle Palaeolithic occupation in Pin Hole is broadly contemporaneous with the MTA levels of Le Moustier, which date between c. 55,000 and 40,000 years ago, in calendar years (Jacobi, *et al.*, 2006), according to the corrections of the dates based on the SFCP Cariaco record (Hughen *et al.*, 2004). I attempted to calibrate all the dates related to the Middle Palaeolithic of Pin Hole with the CalPal2007$_{HULU}$ curve (Figure 24). The results were in the period between 57 and 42 kyr cal BP.

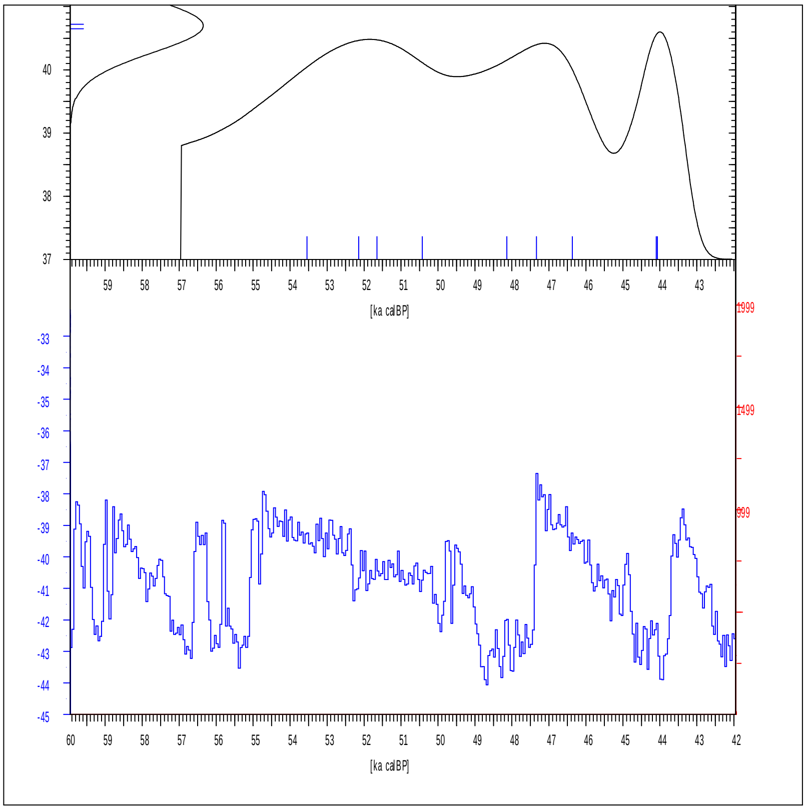


Figure 24: Results of the calibration of the available C14 dates from the Middle Palaeolithic of Pin Hole.

There are three important episodes of climatic amelioration in that period, as identified on the NGRIP climatic curve (Figure 25). The two earlier are more prominent, in terms of intensity and duration. The first of these is placed between 55 and 52 kyr ago and the second between 48 and 46 kyr ago. There is also a later one, which is shorter and less intense. This is placed between about 44 and 43 kyr ago. The three episodes are examined in detail below.

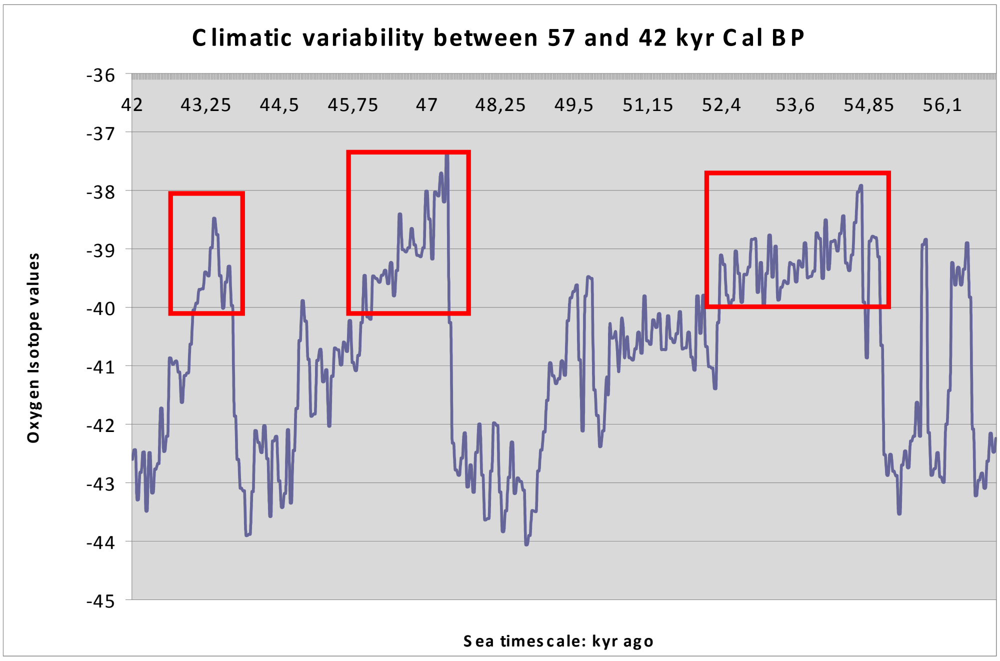


Figure 25: Graph showing climatic variability 55-40 kyr ago. The most important "mild episodes" are indicated with the red boxes. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

The first "mild episode" (Figure 26) starts at c.54, 800 years Cal BP and it lasts for about 2,400 years. After that the climate gradually returns to harsher conditions. Only one of the standard deviations of the calibrated dates from the Middle Palaeolithic of Pin Hole falls within this episode.

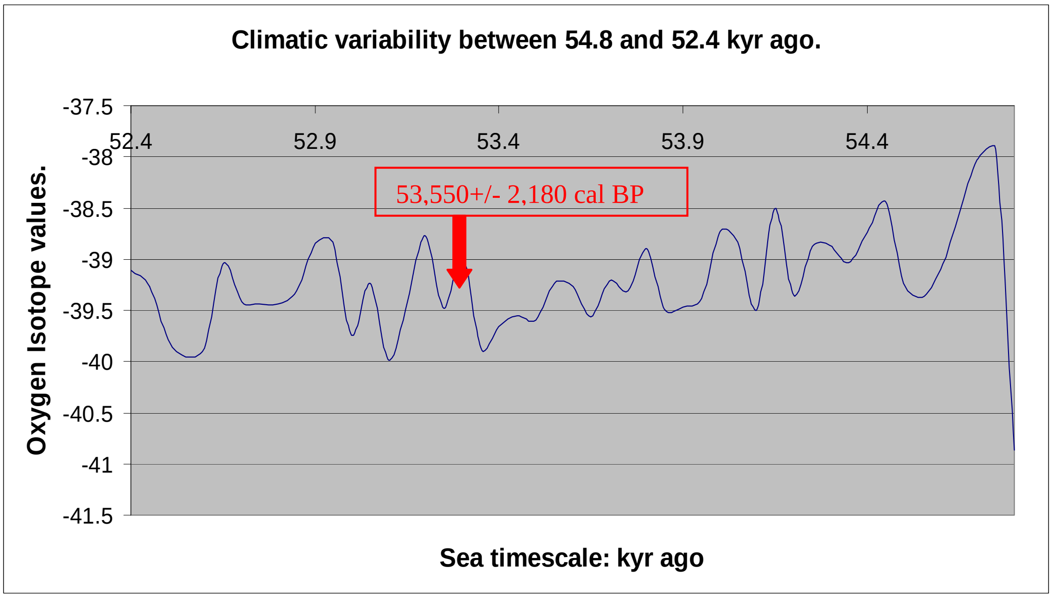


Figure 26: The "mild episode" of c. 54,800-52,400 years ago. Data from NGRIP 2004, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

The second “mild episode” (Figure 27) starts at 47,400 and lasts for about 1,300 years. Two of the standard deviations of the calibrated dates fall within this episode.

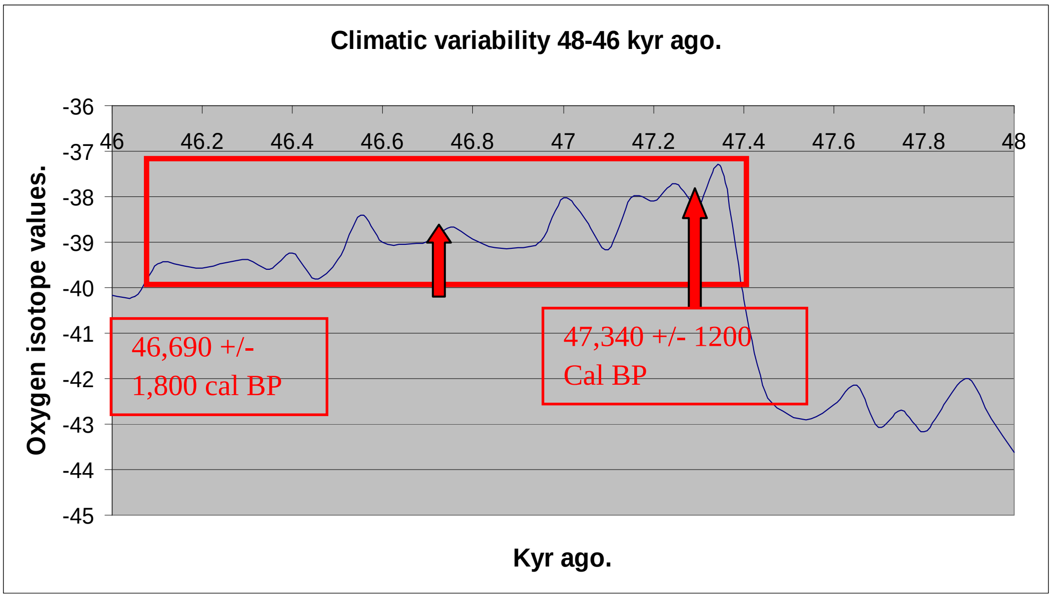


Figure 27: The "mild episode" of c. 47,400-46,100 years ago, indicated with the red box. Data from NGRIP 2004, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Finally, the third mild episode (Figure 28) lasts from 43,650 years ago to 43,050 years ago. This is the shortest episode. None of the standard deviations of the calibrated dates falls within this episode.

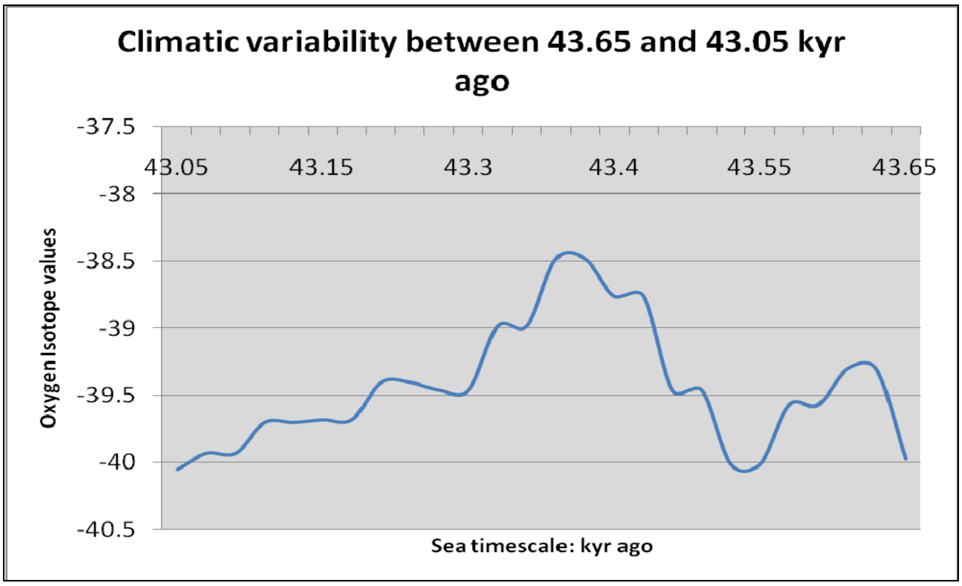


Figure 28: The cimatic amelioration between 43.65 and 43.05 kyr ago.

Given that the calibration curve used in this thesis can change in the future, all these associations will have to remain tentative. Also, the fact that these absolute dates were taken on bones that do not exhibit any signs of human modification does not help to establish a secure association with the presence of humans in any of these episodes.

In any case it is possible that the site was visited by Neanderthals several times in different periods. This may be the explanation for differential patination recorded on the flint artefacts, although this characteristic cannot be formally described in a way that it would produce classification of discrete intra-assemblage groupings. An attribution of the assemblage to various occupation episodes is also consistent with the absence of refits. It is impossible to say with any precision how close or distant in time the different visits might have been. Taking into account the consistency in the behavioural repertoire evidenced in the cave and the unchanging role of this site supported by all the lithics in the assemblage, it may be reasonable to assume that these many visits happened within one “mild episode”.

3.2.3. Robin Hood cave, Creswell Crags, Derbyshire.

Robin Hood cave is situated in Creswell Crags, in the north side of the gorge and about 50 m to the east of Pin Hole (Figure 14). It was excavated by Boyd Dawkins, Thomas Heath and J. Magens Mello in 1875 and 1876 (Dawkins, 1877, Dawkins, 1876) , in 1969 by John Campbell, and finally in 1981 by Rogan Jenkinson. It is the largest cave in the Magnesian limestone of the British Isles (Jacobi, 2006). The front of the cave is divided into two chambers, the western and eastern chambers, while to the back of the cave there are the northwest and the central chambers (Figure 29). The central chamber produced a fauna associated with hippopotamus (Laing, 1890) possibly attributed to the Last Interglacial (MIS 5e). The western chamber was the part of the cave from which the Late Middle Palaeolithic archaeology was recovered.

The 19th century excavation was conducted in the western chamber and western entrance, and the stratigraphy (Figure 30) observed from bottom to top was “red sand and clay”, “cave earth”, and “breccia”. Locally between the “red sand

and clay" and the "cave earth" a "mottled bed" was identified. Between the "cave earth" and the "breccia" there was a "conglomerate" of water worn pebbles, suggesting stream action (Jacobi, 2006). The main bulk of the Middle Palaeolithic artefacts comes from the 19th century excavations, and they were found mainly in the "cave earth", with a few exceptions found in the "red sand and clay" (Dawkins, 1877).

Within the "cave earth" Middle and Upper Palaeolithic artefacts occurred together with no apparent stratigraphic separation. Campbell's excavation took place outside the western entrance of the cave. The spoil of the Victorian excavation and some sediment that was washed out of the cave were dug. Nine quartzite, possibly middle Palaeolithic, artefacts were recovered during this exploration (Campbell, 1977, Jacobi 2006). Finally the 1981 excavation was conducted in the south-western side of the western chamber. The sediment excavated was sandy loam and loamy sand (Griffin, 1988), and cannot be strictly correlated with the earlier excavations in the western chamber. It is possible that it is associated with that part of the deposit, known as "cave earth" (Jacobi, *ibid)*. Two quartzite Middle Palaeolithic artefacts and one on flint (Jacobi, 2006, Table 1) were recovered. The most important evidence uncovered in this excavation was carbonised bone from large mammals.

The fauna from the "cave earth" is a classic Middle Devensian fauna of the Pin Hole Mammal assemblage zone, including wolf, red fox, brown bear, and spotted hyaena, woolly mammoth, horse, woolly rhinoceros, reindeer, and bison. In terms of taphonomy the assemblage seems to be consistent with a hyaena accumulation. The only definite evidence for Neanderthal interaction with the faunal remains is the evidence for carbonised bone from the Jenkinson excavation.

The lithic artefacts that are going to be presented here were all recovered, during the 19th century excavations. Due to the lack of stratigraphic separation between the Middle and Upper Palaeolithic archaeology the artefacts were distinguished on strictly typological terms. The sample was studied in the British Museum and the Manchester University Museum, where most of the material is stored. Many of the pieces originally reported in the 19th century cannot be located now, so this sample should only be taken as a minimum estimation of what was originally discovered in the cave.

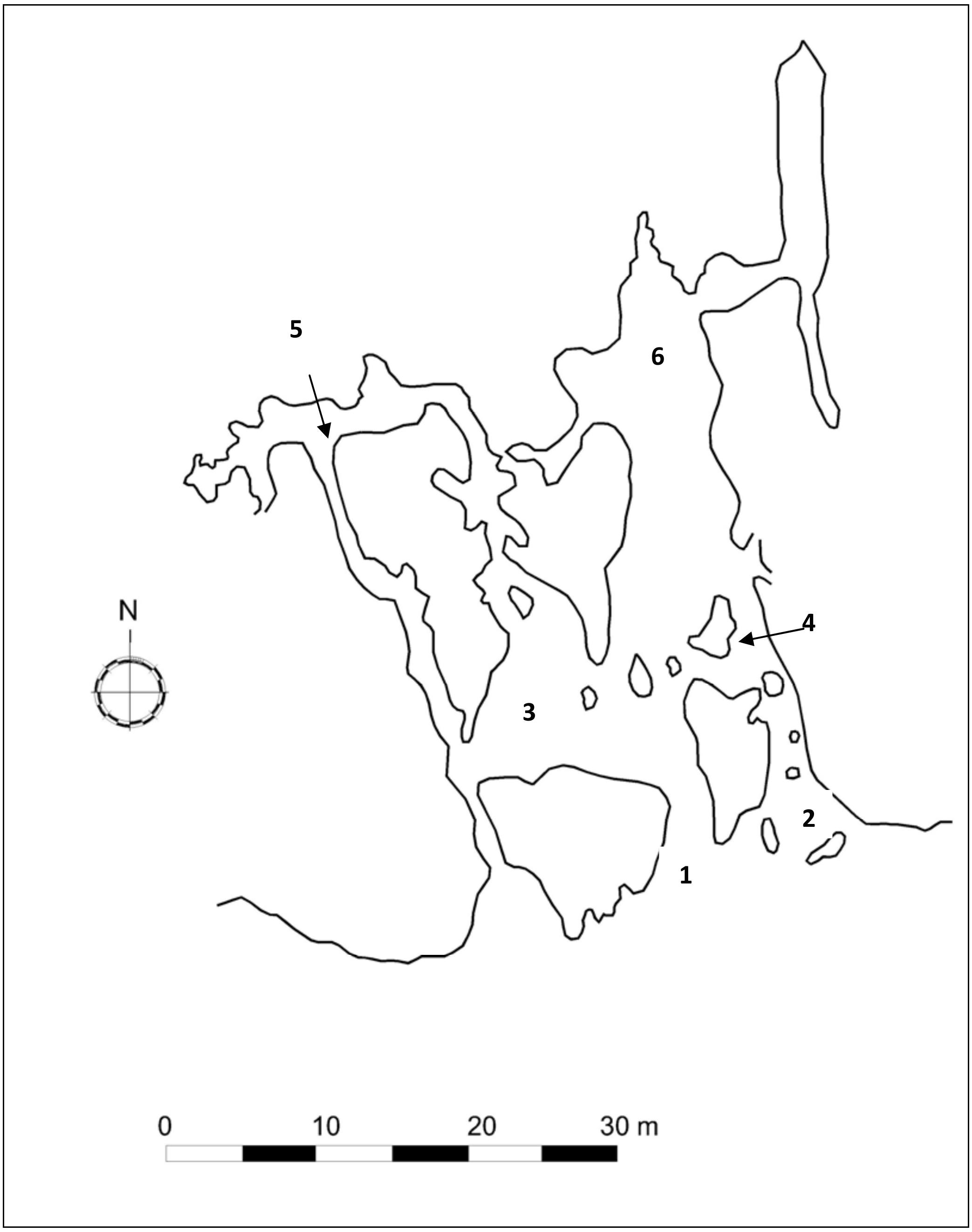


Figure 29: Ground plan of Robin Hood Cave. 1: Western Entrance, 2: Eastern Entrance, 3: Western chamber, 4: Eastern Chamber, 5: North West Chamber, 6: Central Chamber. Redrawn by Aggeliki Zacharia.

The sample consists of 101 artefacts, 80 in the British Museum and 21 in the Manchester University Museum. In the case of Robin Hood Cave a greater variety of materials is observed in comparison to Pin Hole. Apart from quartzite, flint, and clay ironstone, a few artefacts were also made on chert, an ignitic rock and another unidentified type of rock. In this assemblage the most common material is quartzite, representing 52 %, while flint represents 41 %. Clay ironstone is represented by 4 artefacts, chert by 2%, while the ignitic and unidentified rock by one artefact each (Table 6).

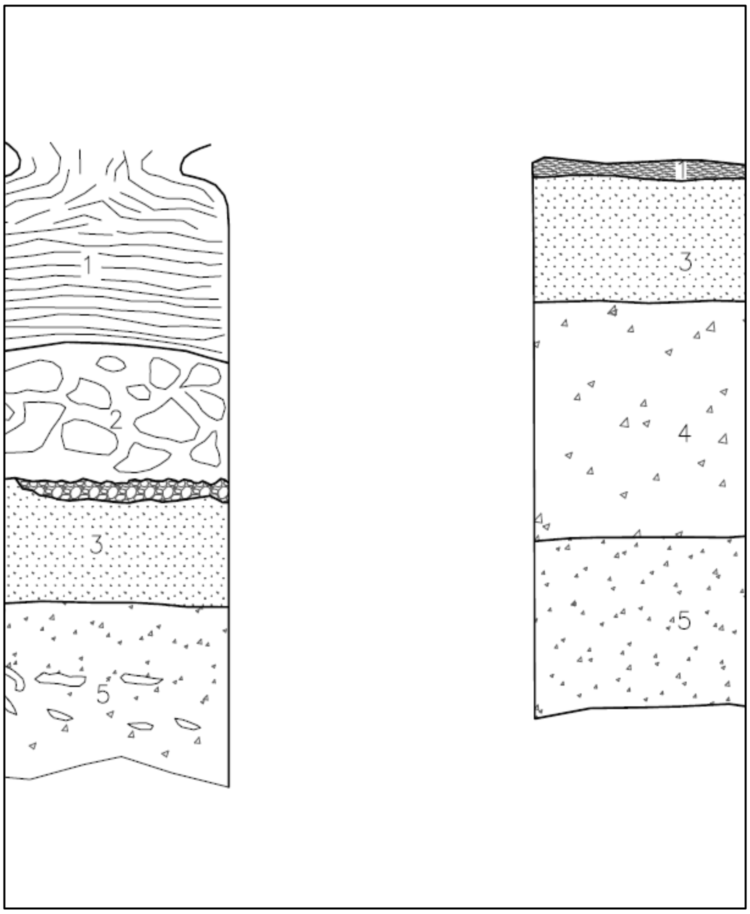


Figure 30: Two local variations of the stratigraphy in Robin Hood Cave (Mello, 1879). On the left: 1. Stalagmite, 2. Breccia, including bones and flint artefacts. A bed of conglomerate of waterworn pebbles at its base, 3. Cave earth with bones and artefacts, 5. Red clayey sand, including bones. On the right: 1. Surface soil, 3. Cave earth with bones and artefacts, 4. Mottled bed, including bones, 5. Red clayey sand, including bones and quartzite artefacts. Redrawn by Aggeliki Zacharia

The variability of quartzite observed in Pin Hole is also witnessed in Robin Hood cave, with brown quartzite being again the most common occurrence (Figure 31). In flint only four artefacts could not be assigned to categories, due to patination. The most common type of flint used was grey “wolds” flint, followed by translucent flint of possibly black colour (Figure 32). The provenance of quartzite, flint, and clay ironstone should be considered to be the same as in the case of Pin Hole. As far as the igneous rock and the chert are concerned, it is possible that they were picked up locally, having reached the area by pre-Devensian drift (Jacobi, 2006), in the same way as the flint. The actual origin for the igneous rock might have been in the Welsh Borders, a bit more than a hundred km away, or the Lake

District, about 150 km away (R.W. Sanderson pers. comm., to Roger Jacobi in Jacobi, 2006). The most likely origin for the chert is the chert beds in the Carboniferous Limestone in the White Peak, about 40 km away (Jacobi, *ibid*).

Raw materials used	**Frequency**	**Percent**
Chert	2	2.0
Clay Ironstone	4	4.9
Flint	41	40.2
Igneous rock	1	1.0
Quartzite	52	51.0
Unknown	1	1.0
Total	**101**	**100.0**

Table 6: Frequency of the raw materials used in the Late Middle Palaeolithic of Robin Hood Cave (pers. obs.).

A local access for the igneous rock is supported by the much worn cortex on the one identified piece, possibly related to a cobble or pebble. As was also observed in Pin Hole most of the pieces on quartzite are cortical (90%), while the opposite pattern is evidenced for flint (60% non cortical) (Figure 33 and 34).

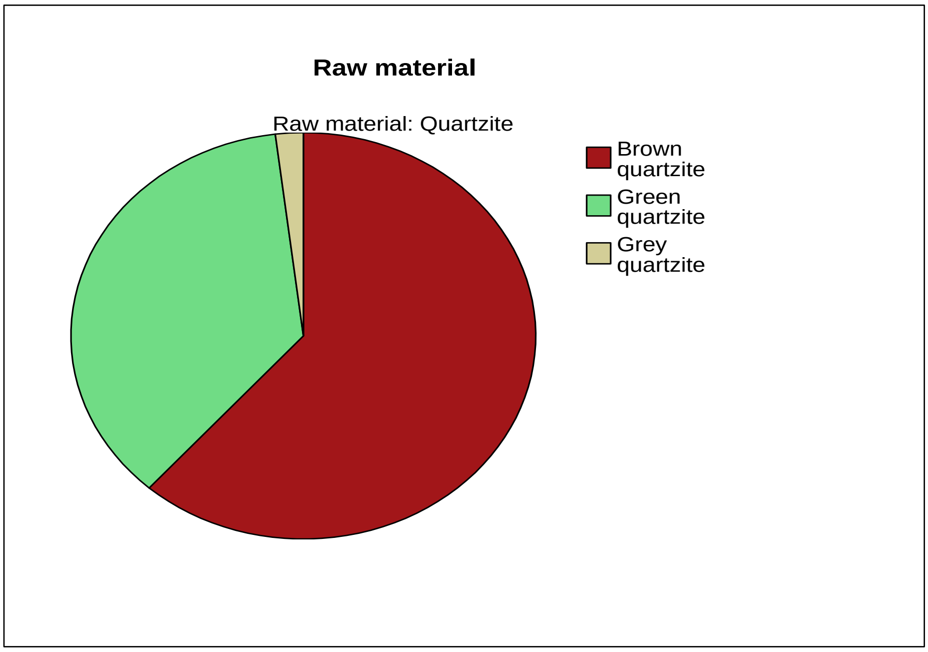


Figure 31: Different types of quartzite, used in Robin Hood cave (pers.obs.).

This pattern could be related to the acquisition of flint some short distance away from the cave. Such an interpretation can be supported by the presence of cortex in different stages of wear on the flint artefacts. This may mean that the flint cobbles or pebbles picked up had not all travelled the same distance from the source to the point of collection, or from different places in the landscape. If we assume that the pebbles with the most worn cortex (alluvial) were picked up in the immediate vicinity of the cave, there should be at least two more find spots further away from Creswell, where flint would have been picked up.

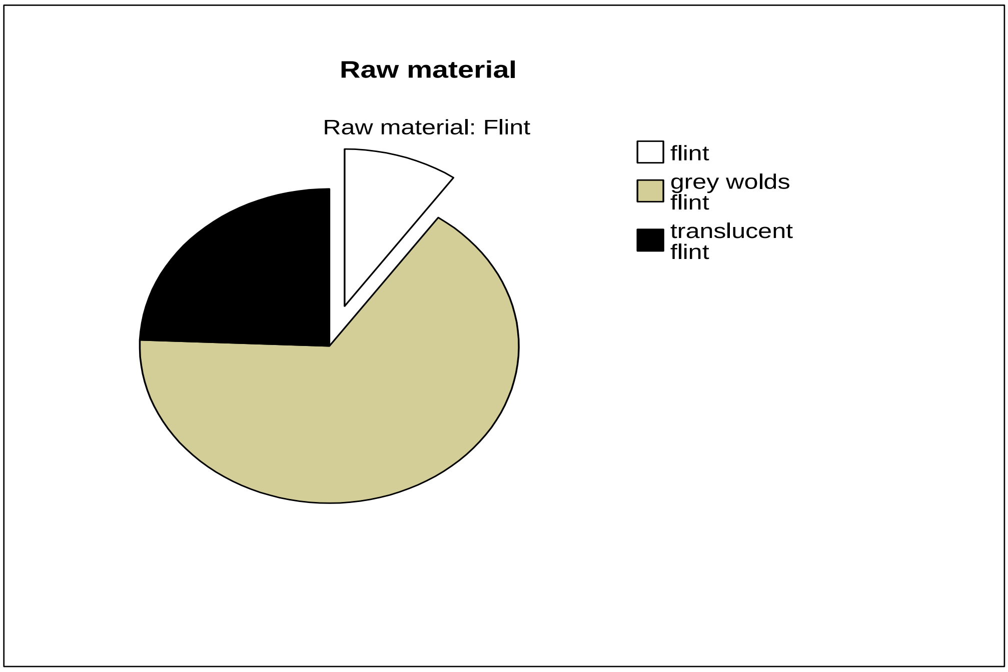


Figure 32: Differt types of flint, used in Robin Hood Cave. The white slice represents unidentified pieces (pers.obs.)

The closest would contain the flint with "much worn" cortex, and the furthest the one with "worn" cortex. Again like in the case of Pin Hole, the presence of clay ironstone gives us the limits of the range of the Robin Hood cave Neanderthals, as a hypothetical circular area with a diameter of 30 km. Again this points to possible relations between the Neanderthals of Creswell Crags and groups that foraged further away.

Table 7 is a presentation of the distribution of different artefact types in the various raw material categories. There are only two pieces of debitage from chert, one of them possibly related to the maintenance of a handaxe. There is one piece of debitage on igneous rock, and one on unidentified material.

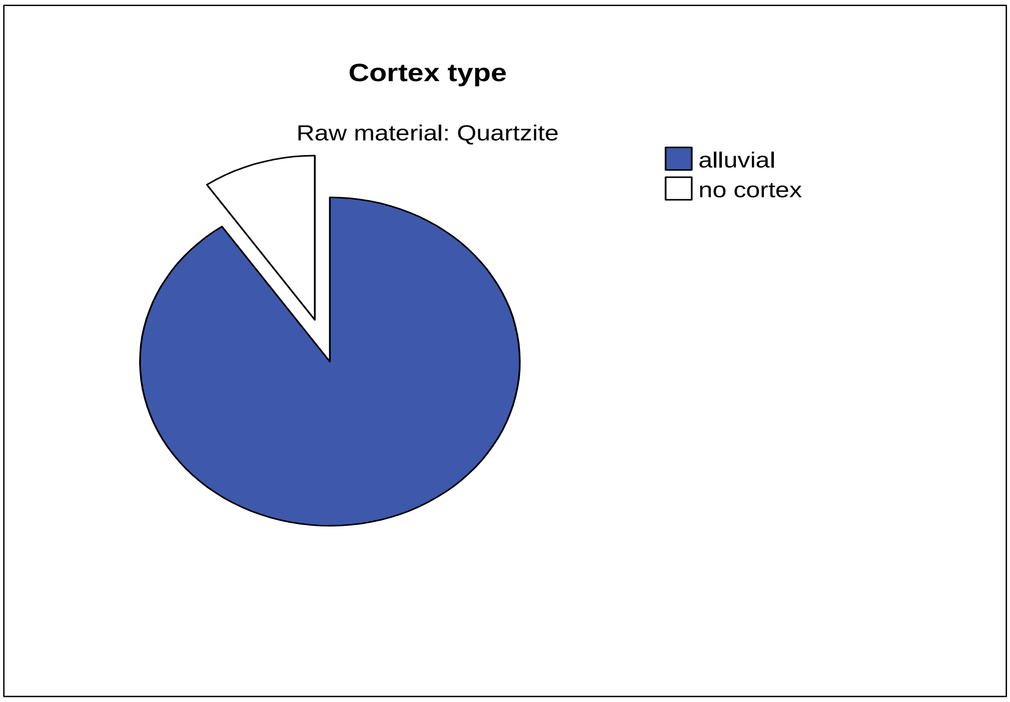


Figure 33: Type of cortex on quartzite artefacts in Robin Hood Cave (Pers. obs.)

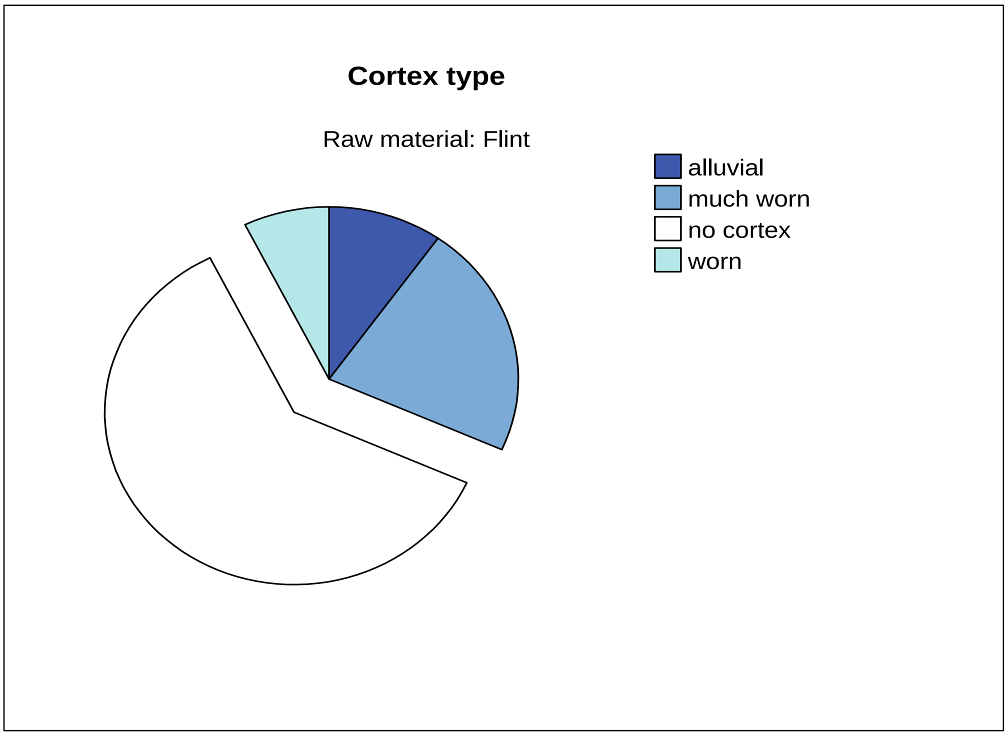


Figure 34: Cortex type on flint artefacts in Robin Hood Cave (Pers. obs.)

Most of the artefacts are made on the three basic materials we can also identify in Pin Hole, flint, quartzite and clay ironstone. About 55% of the debitage is made on quartzite, and 38% on flint. The use of discoidal technique is indicated for flint by the presence of a characteristic core edge removal, and for quartzite by a pseudo-levallois point. There are no flint cores, while there are 7 discoidal cores and a chopping tool on quartzite. A little core or fragment of a core and one piece of debitage are found on clay ironstone. The absence of cores on flint could point to a more intensive exploitation of this material, or the introduction of already worked pieces of flint in the site. It could also mean that flint cores were carried away from the site, to be reduced and discarded elsewhere. The exploitation of quartzite is consistent with a strictly local material which is not exploited intensively. It seems that quartzite pebbles are picked up locally, knapped in the cave and their debitage was used on the spot. Clay ironstone seems to be mainly introduced in the form of finished handaxes, which are the most common artefact on this material.

About half of the scrapers were made on quartzite; the others were made on flint. One scraper retouch spall has been identified on flint. There are 4 denticulates and notches made on flint, and three quartzite cobbles, used as hammerstones. The 2 finished handaxes in my sample were made on clay ironstone, while two partial ones were identified on quartzite. The finished handaxes were one cordiform and one limande. Two more cordiform handaxes, made on flint are mentioned by Jacobi (2006). Evidence for handaxe manufacture or maintenance, in the form of thinning flakes, has been identified for flint and chert. Chert handaxes have not been found and this should be taken as an indication that these implements were possibly made at Creswell, then carried, used and discarded elsewhere. A Levallois blade on translucent flint is not associated with other elements that can be attributed to Levallois debitage. In this sense, it can be interpreted as a tool that was transported to the site in its final form, was probably used there and then abandoned.

The overall picture from Robin Hood Cave seems to be much more complicated than the one from Pin Hole. There are some interesting patterns to be observed in relation with the presence or absence of different parts of reduction sequences. For example it is possible that the Levallois blade was an artefact manufactured somewhere else and transported to Robin Hood cave for use. The opposite could be said about chert handaxes, that they were manufactured in Robin Hood cave to be transported and used elsewhere. The problem with this assemblage is that it is difficult to be confident enough about its stratigraphic integrity and about how representative the surviving sample is to accept the patterns observed as genuine.

Artefact type	Raw material						
	Chert	**Clay Ironstone**	**Flint**	**Igneous rock**	**Quartzite**	**Unknown**	**Total**
Chopping tool	0	0	0	0	1	0	1
Core	0	1	0	0	0	0	1
Debitage	1	1	23	1	34	1	61
Denticulate	0	0	3	0	0	0	3
Discoidal core	0	0	0	0	7	0	7
Discoidal debitage	0	0	1	0	1	0	2
Hammerstone	0	0	0	0	3	0	3
Handaxe	0	2	0	0	2	0	4
Handaxe maintenance piece	1	0	5	0	0	0	6
Levallois debitage	0	0	1	0	0	0	1
Notch	0	0	1	0	0	0	1
Scraper	0	0	6	0	4	0	10
Total	**2**	**5**	**41**	**1**	**52**	**1**	**101**

Table 7: Type of artefact in relation to raw material in the Late Middle Palaeolithic of Robin Hood Cave (Pers. obs.).

The gaps in the reduction sequence could be due to artefacts that were lost either due to natural processes between different occupation episodes, or were not recovered, due to the 19th century techniques, or were recovered and subsequently lost. The fact that about 15% of the total number of artefacts examined, were in different stages of wear, could point to some kind of natural intervention in the assemblage formation in between the different occupation episodes. The absence of refits, like in the case of Pin Hole points to different occupation episodes, eventually averaged in one assemblage.

In terms of activities taking place in Robin Hood cave, everything that was observed for Pin Hole is also true for Robin Hood Cave. There is on-the-spot production of debitage, there is making and use of retouched tools, and there is making or maintenance of handaxes. The extra element is the possibility that handaxes were actually used and/or on the site, since finished handaxes are found in the assemblage. The possible use of handaxes aside, Robin Hood cave would have easily been assigned to the category c) of my site typology (food consumption/resource processing sites) together with Pin Hole. The possible use of debitage for light-duty butchery, of scrapers for hides processing, and of denticulates/notches for wood processing would support such an interpretation. The same is true for the evidence of fire, in the form of carbonised bone.

On the other hand, I mentioned in the case of Pin Hole that I would expect handaxes to be present in sites, where heavy duty butchery tasks would be performed, and these would be sites of category b), namely the kill sites (e.g. Lynford). That this kind of heavy duty tasks took place in Robin Hood at specific points in time may also be supported by the presence of the chopping tool in the sample. Given the palimpsestual character of the assemblage it is possible that the role of the site changed at a specific point in time from c) to b) or the opposite, following environmental change that would have affected animal behaviour. Another explanation could be that heavy duty butchery took place at some point in the immediate vicinity of the site but not in the actual site. I did not have the opportunity to examine the flint handaxes, but the clay ironstone ones were clearly rolled. In this case we should take into consideration the possibility that these elements were introduced to the assemblage from outside. The cave used to have an entrance (now blocked) at the top of the limestone plateau (Jacobi, 2006). I think that there is a possibility that at some point in time butchery activities took place at the plateau, and the handaxes left behind eventually rolled in the cave and were incorporated in the cave earth.

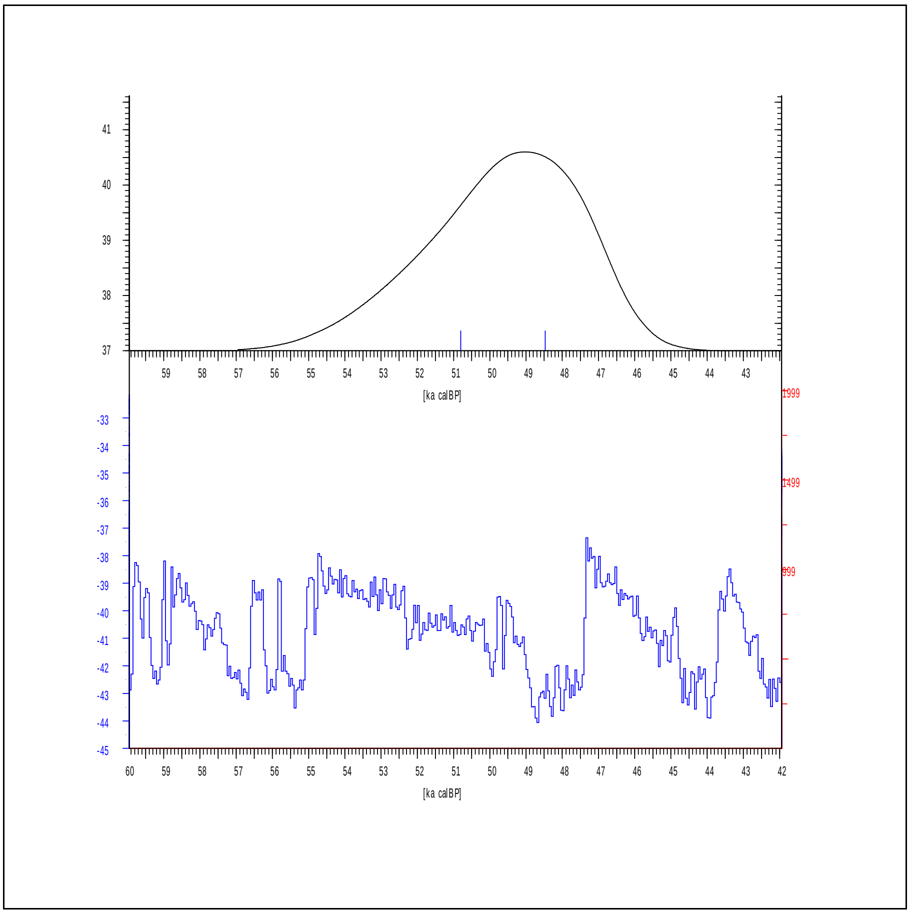


Figure 35: Results of the calibration of the two absolute dates from Robin Hood Cave. The date range shown includes two of the identified mild climatic episodes.

The most recent dating for the Middle Palaeolithic of Robin Hood cave has shown a similar chronological range with Pin Hole, between 55 and 40 kyr ago, in calendar years (Jacobi, *et al.*, 2006), according to the SFCP Cariaco correction curve (Hughen *et al.*, 2004). There are two finite dates one at c. 45,300 +/- 1000 kyr ago and one at c.47,300+/- 1200 years ago for Robin Hood Cave. Their calibration with CalPal2007$_{HULU}$ gives an age range between 57 and 44 kyr ago (Figure 35). In this sense it would not be unreasonable to propose an occupation of Robin Hood, during one of the two older "mild episodes" mentioned for Pin Hole (Figure 26 and 27). This of course should not be taken to mean that the occupation of the two sites was strictly contemporaneous. The palimpsestual character of both assemblages and the partial information surviving from old excavations does not permit such precise correlations. Simultaneous or subsequent use of the two caves is equally possible, with the role of Pin Hole being constant, while in the case of Robin Hood cave there was a possible shift of strategies through time.

3.2.4. Oldbury, Kent.

Oldbury Hill is situated near the village of Igtham in Kent. The first excavations in the area were conducted by Benjamin Harrison, the village grocer, in August 1890 (Harrison, 1892, Harrison, 1933). Harrison had found in the past on the slopes of the hill artefacts that he had identified as “rockshelter” implements. By this term he was referring to their similarity to handaxes and flake tools from rockshelters, excavated in South-Western France. He had also been able to distinguish these artefacts from the “river drift” implements that he found in the deposits of the Shode valley (Cook and Jacobi, 1998). This was the first indication that the Palaeolithic material from Oldbury, probably dated from the Last Glaciation.

Harrison’s excavations started, at the site of a rock overhang, which he perceived as a possible rock-shelter, but unfortunately the location did not preserve any significant stratigraphy and only a few finds of Holocene date were recovered (Cook and Jacobi, *ibid)*. For this reason the excavation was moved to the slopes of the hill, but there trees and large boulders made the excavation very difficult, and the works were moved downhill once more. Harrison (1892) describes the new excavation site as “the bold projecting spur below Mount Pleasant lying about fifty yards south east of the former digging”. This site was located at the bottom of the valley adjacent to Oldbury Hill, near a prominent rock outcrop. It was there that an *in situ* assemblage was discovered, over an area of 7-8 m^2. The archaeology was contained in sediment varying in depth from 75-90 cm. According to Harrison’s manuscript the assemblage was found at the base of the deposit, immediately overlaying a gravelly wash (Cook and Jacobi, 1998). The stratigraphic position of the assemblage was confirmed by the Collins’ excavation, which also produced some more artefacts (Collins and Collins, 1970).

The assemblage as a whole, including artefacts in primary position from the Harrison, and Collins’ excavations below Mount Pleasant, but also the surface finds picked up by Harrison on the Oldbury slopes, has long been classified as: “identical with Le Moustier” (Smith, 1926), Mousterian (Mellars, 1974) and Mousterian of Acheulean Tradition (Collins and Collins, 1970, Roe, 1981, 182; (Coulson, 1990). This has been done in terms of typology and condition of the artefacts. In this sense there has been a consensus, vindicating Harrison’s original view of the artefacts, which was to correlate them with assemblages from what today is termed the Last Glaciation. Furthermore the recent re-examination of the collections in the British Museum by Cook and Jacobi (1998), showed further typological and technological affinities with assemblages from other sites, for which we now know with certainty that they date to MIS 3, on the basis of biostratigraphy and absolute dates. In this context the assemblage from Oldbury will be considered here as part of the Late Middle Palaeolithic occupation of Britain, although this association will for the moment remain beyond the limits of scientific proof.

There was no fauna associated with this assemblage. The hypothetically Late Middle Palaeolithic artefacts will be examined in two groups, the first including those in primary condition, found at the bottom of the hill, and the second the ones that were probably picked up by Harrison on the surface of the hill slopes. These two groups will be taken to represent two localities at a very short distance from one another, and an attempt will be made to understand them as two parts of the same site. From now on, I will call the site below Mount Pleasant Locality 1 and the slopes of the hill Locality 2.

Cortex type		
	Frequency	**Percent**
No cortex	301	74.9
Very worn	98	24.4
Worn	3	.7
Total	401	100.0

Table 8: Frequency of cortical pieces in the Oldbury assemblage, Localities 1 and 2 (pers. obs.)

The total of the Harrison and Collins collections, housed in the British Museum were examined, including 360 artefacts from Locality 1 and 42 artefacts from Locality 2. The two categories were distinguished on the basis of artefact wear. All the artefacts from below Mount Pleasant were in mint condition, while the surface finds from the slope indicated various stages of wear, with none of them being so worn as to indicate a serious displacement by water action. They were all made on black flint. The stage of wear on the cortex, where it was preserved, indicates the use of flint cobbles. Most of the artefacts did not preserve any cortex, and this may indicate that the primary knapping of these flint cobbles had occurred elsewhere (Table 8). This pattern was valid for both groups of artefacts, when examined separately.

From the 360 artefacts at Locality 1, 90% can be assigned to the category of debitage. Of these 15% come from what can clearly be identified as discoidal debitage and are in the form of core edge removals, pseudo-levallois points, and short broad flakes (Boëda, 1993). 13.9% come from the making of handaxes, and a feeble 0.8% come from the retouching of flake tools. Most of them, a total of 60% can only be classified as undifferentiated debitage. There are 7 cores of which 4 can be identified as discoidal. The other three are a core fragment, one core on a flake, and one split cobble. In the categories of retouched tools there are 21 side scrapers, 4 notches, 2 denticulates, and one end-scraper. Finally, there is a part of a broken handaxe (Table 9).

Type of artifact		
	Frequency	**Percent**
Broken Handaxe	1	.3
Core	3	.8
Debitage	217	60.3
Denticulate	2	.6
Discoidal Core	4	1.1
Discoidal debitage	54	15.0
Scraper	22	6.1
Handaxe thinning flake	50	13.9
Notch	4	1.1
Tool retouching piece	3	.8
Total	360	100.0

Table 9: Artefact types in the group excavated under Mount Pleasant (Locality 1) (Pers.obs.)

The fact that the assemblage from Oldbury, Locality 1 was not associated with any faunal remains indicates that this site should be possibly attributed to category a) of the site typology described in the previous chapter, namely the rest/re-creation/observation sites. In this category are included sites that function as hunting stands, where preparations for hunting expeditions are taking place, but no processing or consumption of animal resources occurs. These sites are visited for very short periods of time, possibly only a few hours, and this explains the lack of need to build a fire or to seek natural shelter. Of course given the absence of information on the preservation conditions at Oldbury, it will never be absolutely certain, whether bones and evidence of fire actually existed in the past and were subsequently destroyed. Nevertheless, the interpretation presented here can only be based on existing information.

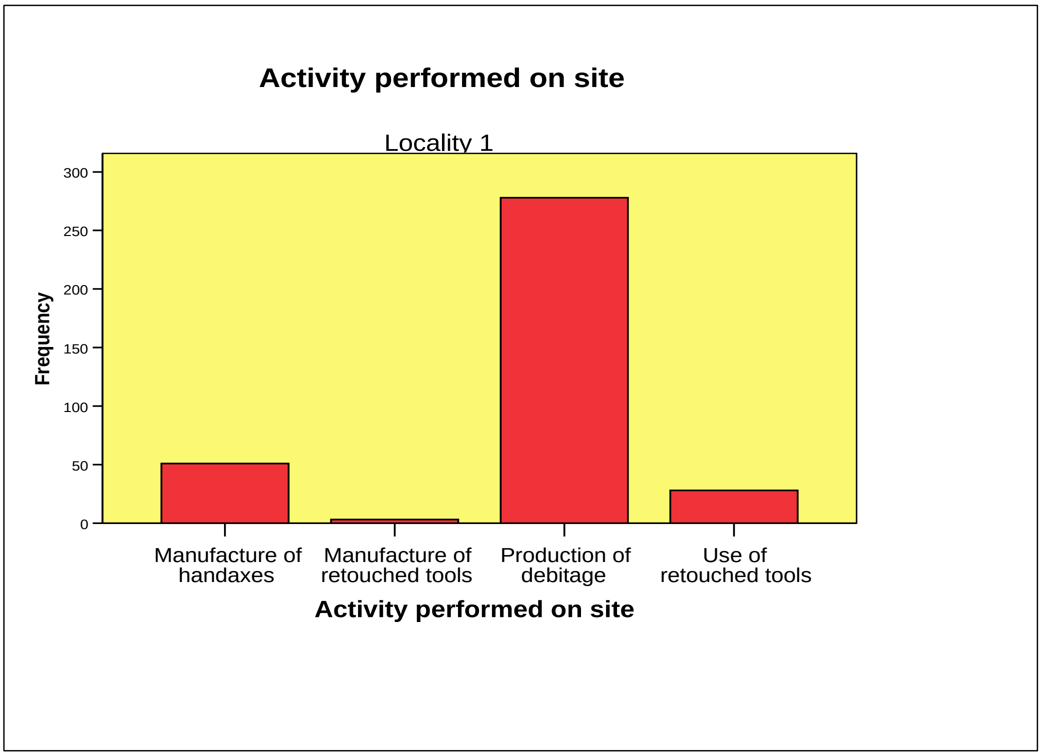


Figure 36: Activities performed in locality 1 of Oldbury (Pers.obs.)

This typological attribution is supported by the lithic material from this locality. Figure 36 is a summary of the activities performed on the site. The most common activity in Locality 1 was the production of debitage, followed by the manufacture of handaxes. Third was the use of retouched tools and last the manufacture of retouched tools. I proposed in the previous chapter that knapping activities in the sites of type a) would have had more than a merely functional role, and that they would contribute to the social cohesion of the hunting group. Parallel to this, knapping could have been a relaxed way to pass the time, while waiting at these hunting stands. This may be the explanation for the great quantities of debitage found at this spot. The preparation of handaxes, which are then transported elsewhere, is also consistent with this type of site, since handaxes tend to be transported to kill/butchery sites in a nearly finished form as we saw in the case of Lynford. The role of manufacture and use of scrapers, denticulates, and notches on the spot could have been related to the preparation of wooden spears that Neanderthals would use in their hunting expeditions. It is difficult to ascertain the number of visits represented by this assemblage. The fact though that there are no refits points to an unspecified number of episodes.

The picture evidenced in Locality 2 is a bit different. The artefacts from the latter Locality are presented in table 10.

Type of artifact		
	Frequency	**Percent**
Debitage	18	42.9
Denticulate	3	7.1
Discoidal debitage	2	4.8
Handaxe	11	26.2
Handaxe thinning flake	3	7.1
Partial Handaxe	1	2.4
Scraper	4	9.5
Total	42	100.0

Table 10: Frequency of the different types of artefacts in the group from the Oldbury slope (Locality 2)(Pers. obs.)

Debitage, including discoidal flaking and handaxe manufacture, is again predominant in this part of the assemblage, but it takes up a smaller percentage of 54.8%. Finished artefacts seem to take up a greater part with handaxes alone representing 26.2%. The handaxes are 4 cordiforms, 3 triangulars, two discoids, and 2 sub-triangulars (Bordes, 1961a). One of the latter is described as a bout-coupé by Tyldesley (1987). There are also 4 scrapers, 3 denticulates and a partial handaxe in this group. Taking into account that these artefacts are possibly surface finds, this sample cannot be regarded as representative. It can merely give us a glimpse of some of the activities that took place on the slope of the hill, but there is no way to know if these were contemporaneous or happened in distinct episodes.

Taken as a whole this group is not very different from the assemblage of Locality 1. The only significant difference is the presence of handaxes, which in the case of Lynford were associated with a butchery/kill site. Like Locality 1, no faunal remains have been associated with this part of the assemblage. But in this case we are dealing with artefacts that were probably collected from the surface. We do not know where they were originally deposited, and if in the original context they were actually associated with fauna. In this sense possible association of the surviving archaeology from Locality 2 with a kill/butchery site cannot be totally ruled out. In the same terms, it is impossible to know if there was use of fire at the site, where these artefacts were originally deposited. For this reason, their original association with a food consumption/resources processing site is also possible.

Comparing the handaxes from Oldbury, Locality 2 and Lynford, there is in general the same range of variation in the biface types, as described by Bordes (1961a). White (2003) has noted an emphasis on the presence of discoids and cordiforms in the Lynford assemblage. The Oldbury assemblage contains both of these types, but due to each small sample size, it is difficult to discern the most dominant type. The greatest difference between the handaxes in the two assemblages is related with the evidence for use re-sharpening and re-use that have been identified in Lynford and are not present in the sample from Oldbury. In this sense, there is no evidence for correlating Oldbury with a butchery site through such a comparison. Once more the fact that this is a sample that was probably compiled from various parts of different assemblages does not make things any easier.

It is possible that there was a range of Middle Palaeolithic occupation across the whole slope of the Oldbury Hill. Some of it would have remained buried, while parts of it would have been exposed by erosion of the slope, thus creating a palimpsest on a slope. This would have a very complicated outcome, where assemblages with very different dating would get mixed through time. Oldbury is just another example of the complexities of Neanderthal archaeology in this period.

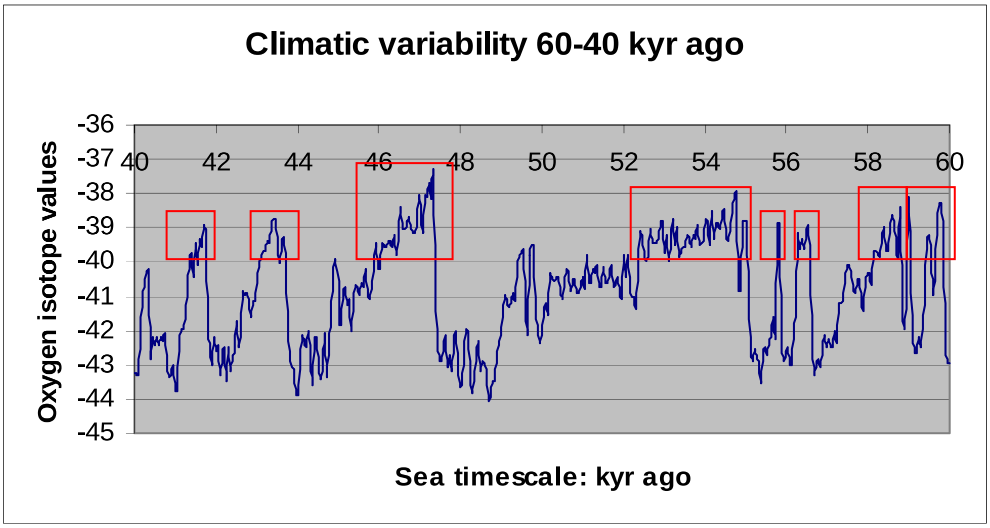


Figure 37: Graph showing climatic variability 60-40 kyr ago. The "mild episodes" are indicated with the red boxes. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Due to the lack of absolute dating for the Oldbury assemblage, it is impossible to attribute this site to a specific “mild” episode. If Oldbury, like the rest of the Late Middle Palaeolithic occupation of Britain, dates between 60 and 40 kyr ago, it is possible that it is associated with any of the “mild” episodes in this period (Figure 37).

3.2.5. Kent’s Cavern, Torquay, Devon.

Kent’s Cavern is situated in Torquay, Devon. It lies at the south end of a block of Devonian Limestone on the north side of Torbay. It has a total passage length of nearly one km, and is the third largest cave in the area of Devon. Kent’s Cavern was mainly excavated in the 19th century, when a good proportion of its sediment was removed (Proctor and Smart, 1989). The first exploration of the cave was by Father John McEnery, between 1825 and 1829. McEnery excavated some of the Middle Palaeolithic handaxes, casts of which exist today in Torquay Museum, but he did not follow a scientific methodology and his understanding of the stratigraphy remained inadequate (Pengelly, 1869).

The most important research period for the cave was between 1865 and 1880, when it was excavated by William Pengelly. Pengelly conducted his excavations with a methodology that can be compared with modern standards. He used arbitrary excavation units for recording the artefacts, while at the same time he noted the geological stratigraphic sequence (Pengelly, 1865, Pengelly, 1866, Pengelly, 1867, Pengelly, 1868, Pengelly, 1869, Pengelly, 1870b, Pengelly, 1870a, Pengelly, 1872, Pengelly, 1873, Pengelly, 1874, Pengelly, 1875, Pengelly, 1876, Pengelly, 1877, Pengelly, 1878a, Pengelly, 1879, Pengelly, 1880, Pengelly, 1878b). Today's understanding of the cave stratigraphy is mainly due to Pengelly's work. Excavations were continued in the cave, during the 20th century (Dowie, 1928, Benyon et al., 1929, Smith, 1940), but these attempts were poorly executed and documented (Straw, 1996).

The stratigraphy of the cave was formally established by Campbell and Sampson, based on William Pengelly's notes. The sequence was the following from top to bottom (Campbell and Sampson, 1971):

Black mould ('Soil'- silt, organic and cultural debris)

Granular stalagmite (Speleothem)

Cave Earth (Debris flow)

Crystalline stalagmite (Speleothem)

Breccia (Debris flow)

The Black Mould contained artefacts dating to the Holocene, the cave earth mixed artefacts of Middle and Upper Palaeolithic age, and the breccia Lower Palaeolithic artefacts (Straw, 1996). Both the breccia and the cave earth were introduced to the cave from outside. The cave earth was mainly introduced through the north entrance, while a smaller input of cave earth took place through smaller fissures. There was movement of this sediment within the cave and part of it exited the cave again through the south entrance (Straw, *ibid*), (Figure 38).

A date of 74,000 yr ago provides a terminus post quem for the formation of the cave earth, and the Middle Palaeolithic archaeology it contains, namely after MIS 5a. Given the fact that Britain seems to have been abandoned between MIS 6 and 3, it is more likely that the Middle Palaeolithic archaeology in the cave dates to MIS 3.

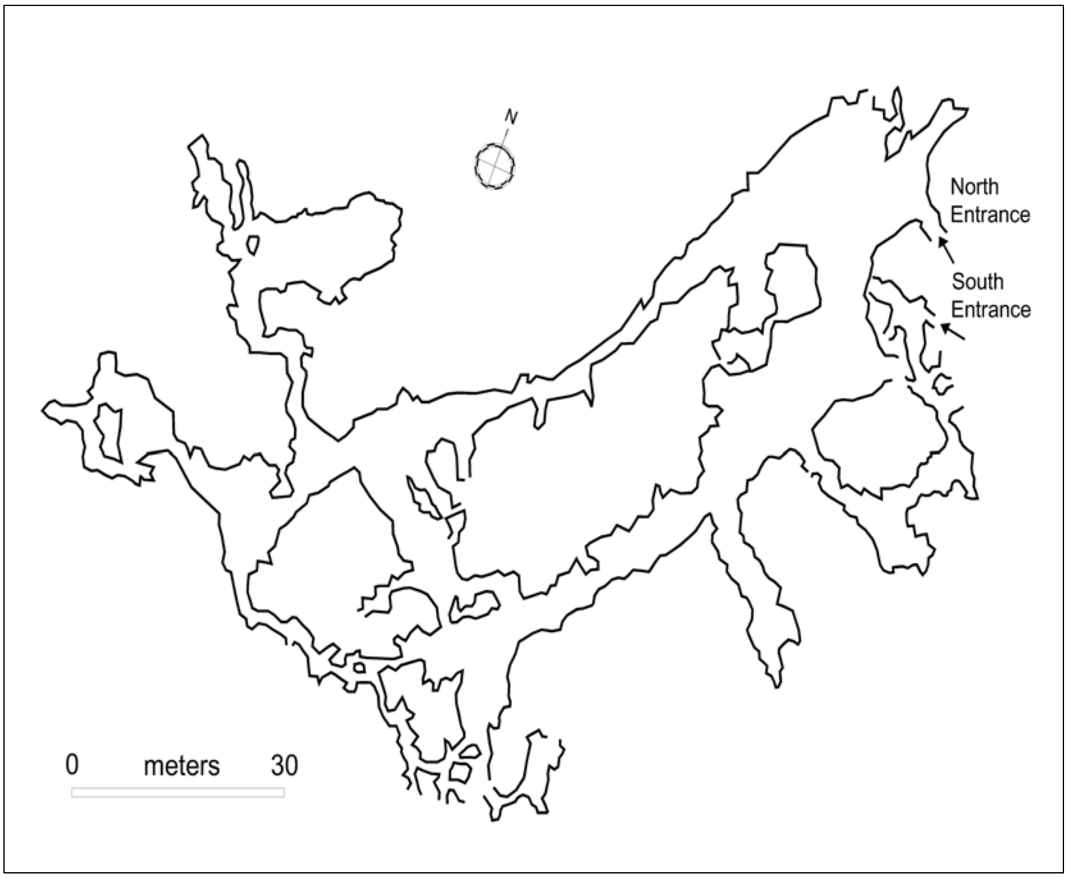


Figure 38: Ground plan of Kent's Cavern, showing the parts were cave earth was deposited, as well as the direction of entry and exit of this sediment. Redrawn by Aggeliki Zacharia.

There are about 30 artefacts from the cave earth that can be attributed to a Middle Palaeolithic age (Wragg-Sykes, 2004), and they are housed in the Torquay Museum, the British Museum, the Natural History Museum, and the Liverpool Museum. From these I examined 25, namely all the artefacts that I could locate in the Torquay Museum and the British Museum. The other 5 artefacts, mainly pieces of debitage, are all depicted in Wragg-Sykes' dissertation (ibid) and do not change the picture of the assemblage in any significant way. The artefacts were found in the cave earth mixed with a bone accumulation, attributed to the activity of hyaenas. This bone accumulation included wolf, red fox, brown bear, and spotted hyaena, woolly mammoth, horse, woolly rhinoceros, reindeer, red deer and bison. Thus it corresponded to the south-west variant of the Pin Hole mammal assemblage zone.

In general, the artefacts are in various stages of wear and it seems that they were introduced in the cave as debris flow together with the cave earth. Consistent with this interpretation is the scarcity of artefacts in this deposit, and their distribution in different depths within the deposit and in different cave areas. This may also explain the absence of any signs of micro-debitage from this assemblage. Two materials were used, a grey-black flint of unknown origin and a good quality white chert, which occurs locally. Of the 25 artefacts examined 19 were non cortical and only six preserved traces of cortex on their surface. In all cases the cortex was much worn, indicating a use of pebbles for both materials. Given the disturbed character of the assemblage, these 25 artefacts are taken here as a minimum estimation of the activities that took place in the vicinity of the cave, at possibly different points in time. Questions of chaine operatoire are not easy to answer and different possibilities can only be suggested and discussed. The artefact types are presented in table 11.

	Raw material		
Type of artifact	**Chert**	**Flint**	**Total**
Broken Handaxe	1	0	1
Core	1	0	1
Debitage	5	0	5
Handaxe	4	1	5
Levallois debitage	0	4	4
Scraper	2	3	5
Scraper on discoidal debitage	1	0	1
Scraper on Levallois flake	3	0	3
Total	17	8	25

Table 11: Artefacts made on chert and flint in the Middle Palaeolithic of Kent's Cavern (Pers.Obs.).

Handaxes and scrapers were made on both flint and chert, and the same holds true for Levallois debitage. Only Levallois pieces on chert were retouched into scrapers. For the Levallois flakes on flint I would consider the possibility that they were intended to be knives. There is one chert scraper on a flake from a discoidal core, indicating the co-existence of Levallois and discoidal techniques in the Kent's Cavern vicinity. Finally there is a small typologically indistinct core, and 5 relatively large unretouched flakes on chert. The handaxes are 2 triangulars, 2 sub-triangulars and 1 cordiform (Bordes, 1961a). Tyldesley (1987) identified four of these as bout-coupé.

Overall the main characteristic of the Kent's Cavern assemblage is the presence of finished artefacts in the form of tools, or blanks for tools and the absence of the previous stages of the core reduction sequence. I mentioned above that this is a pattern that could be explained by the site formation processes, but since we can never be sure about the original composition of the assemblage, I will present two contrasting explanatory scenarios here.

In the first scenario I infer that the greatest part of the assemblage is missing. This is the cores, debitage and micro-debitage, which preceded and accompanied the production of the tools and blanks. In this case the assemblage from Kent's Cavern could compare with the one from Oldbury in Kent, falling in category a) of rest/recreation/observation sites. The area outside Kent's Cavern would provide a good view of the landscape for Neanderthal hunters, tracking down herbivore movements. Communal knapping would have occurred and the production of tools could have resulted, with the passage of time, in a cache, at a site that was possibly often visited. The tools of this cache would be the ones that found their way into the cave earth.

In the second scenario I examine the possibility that what survives today is the original state of the assemblage. This would mean that in the original assemblage there were no cores and debitage and the tools were carried to the site in a finished form.The presence of finished artefacts carried into a site is reminiscent of Lynford, included in the category c) of butchery/kill sites. Again though, it seems that there are parts of the assemblage that are missing. Where is the evidence of animal butchery, in the form of humanly modified faunal remains, and tool maintenance that we would expect at any butchery site? In my opinion there is no way that the surviving assemblage is an accurate representation of the archaeology deposited in the vicinity of the site in the past.

In view of the above I would prefer to accept the first scenario, as the most probable interpretation. An attribution to site category a) is consistent with the topographical position of Kent's Cavern assemblage on top of a hill. It is possible that the smaller parts of the assemblage were moved, due to natural processes, in the course of time, leaving the larger artefacts *in situ*. The latter eventually found their way into the cave, through the north entrance, along with sediments and other rocks forming the cave earth deposit. In the cave earth they got mixed with the hyaena bone accumulation. It is also possible that the smaller parts of the assemblage were lost, due to movements, after the sediment entered the cave. All these processes would be expected to have happened in a gradual progression, as indicated by the various stages of wear on the artefacts of this assemblage.

As in the case of Oldbury, there is no precise absolute dating for the Middle Palaeolithic assemblage of Kent's Cavern. An attribution to any of the "mild episodes", between 60 and 40 kyr ago (Figure 40), can be considered equally possible.

3.2.6. Hyaena Den, Wookey, Sommerset.

Hyaena Den is situated at Wookey Hole, a village on the southern flanks of the Mendips and two miles to the north-west of Wells. The cave is in a ravine, formed in the Dolomitic Conglomerate of Triassic age and it is close to the left bank of the river Axe about 50 m downstream from its rising point. It was discovered accidentally in 1852, during the cutting of a mill leat. About 3.5 m of the mouth of the cave and its contents were cut away to form an embankment on the west side of the leat. Hence, the form of its original entrance is unknown. The workmen, after cutting through solid rock, encountered only earth and stones. This mass had completely filled the cave, concealing its entrance. They collected some Holocene material from the upper layers and Pleistocene fauna from a 30 cm bone bed at the bottom of the sequence. No Palaeolithic archaeology is known to have been discovered at this stage (Dawkins, 1862).

In 1859 systematic excavations were initiated by Boyd Dawkins and were continued at least up until 1874. Dawkins worked in all parts of the cave, clearing most of the sediment. He found three places in the main chamber of the cave (antrum), where Palaeolithic stone tools were deposited and also one solitary implement, towards the back of the cave. The archaeology was associated with a bone layer between two layers of red cave earth. Some implements had also been found in the red cave earth, underlying the bone bed (Figure 39). It was on this stratigraphic evidence that Dawkins based his interpretation of the archaeology as consisting of two industries (Dawkins, 1862, Dawkins, 1863, Dawkins, 1874). A mixed material of Late Middle and Early Upper Palaeolithic age survives from this excavation.

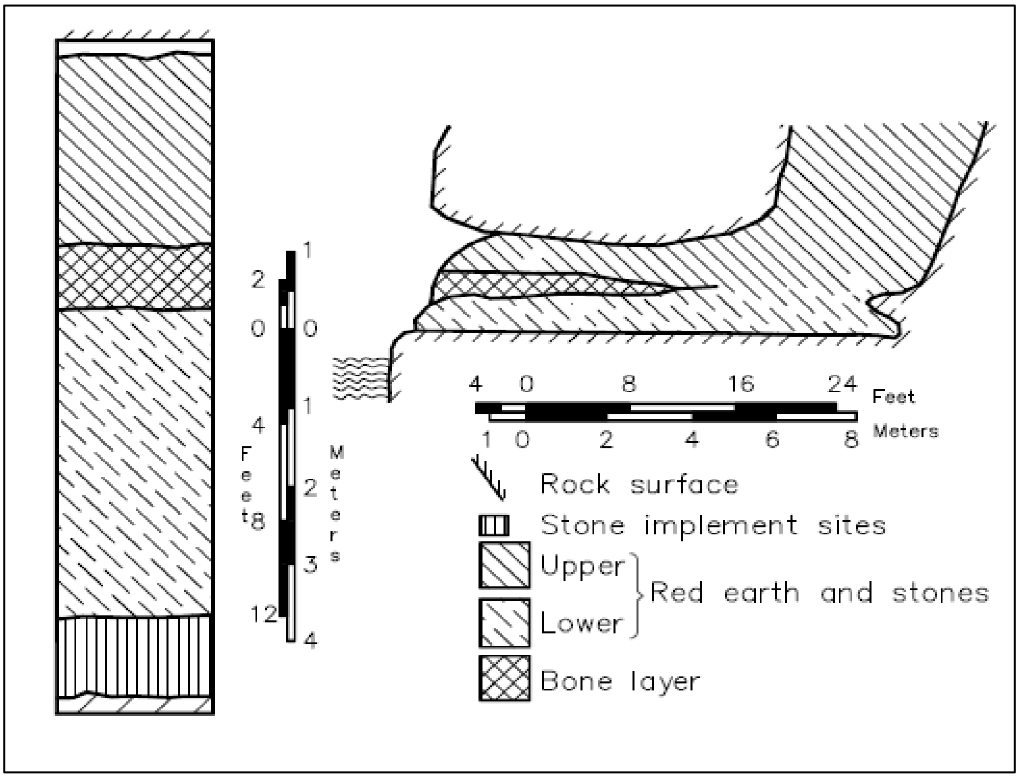


Figure 39: Stratigraphy of Hyaena Den (Tratman et al., 1971). Redrawn by Aggeliki Zacharia.

After 1877, Balch spent several years exploring the cave, and the diggings by Church, Brooks, and Troup probably belong to this period as well (Balch, 1929). Balch discovered archaeology associated with evidence of fire, but this archaeology cannot be traced today. In 1971 Tratman *et al.* attempted a new excavation of the site, aiming to better understand the Dawkins stratigraphy, and investigate if the archaeology could really be divided in two industries. Unfortunately, most of the sediment had been already removed by the Dawkins' excavations and so the stratigraphy could not be re-examined in detail. No archaeology was discovered, during this exploration.

Finally, the most recent exploration of the site took place in 1991-92 (Jacobi and Hawkes, 1993). Disturbed sediments from the Victorian spoils and undisturbed sediments were excavated. The undisturbed sediments were in the form of red cave earth, from which micro-debris of flint and chert was recovered. The excavators suggested *in situ* knapping and/or tool maintenance in the cave. The abundance of chert chippings may be an indication that these activities are related to the Middle Palaeolithic occupation, since chert does not seem to have been used for the Upper Palaeolithic artefacts. From the same sediment they discovered many pieces of charred bone and hyaena coprolite, as well as small numbers of bones and teeth. Cut marks were identified on an incisor of red deer. The evidence of charred bone seemingly confirms Balch's finds. There is no indication from this most recent report that the archaeology can be divided in two industries, at least not in stratigraphic grounds.

From the fauna originally excavated from the site most bones are now lost. The descriptions in the Dawkins' reports (1862, 1863), show an association of the fauna with the south west variant of the Pin Hole mammal assemblage zone (Chapter 2, Table 1), including wolf, red fox, brown bear, and spotted hyaena, woolly mammoth, horse, woolly rhinoceros, reindeer, red deer and bison. The presence of red deer in this area of Britain is very important, because it may be correlated with closed environments, possibly wooded valleys. Such an environment might have created refugia for Neanderthals and other animals.

Dawkins refers to 35 artefacts excavated in total from the cave (1874), while Tratman *et al.* (1971) describe 37 artefacts recovered from the total of the early excavations. From the latter descriptions and drawings about 27 surviving artefacts can be possibly attributed to a Middle Palaeolithic age. These are 4 flint handaxes, of which one has been identified by Tyldesley as a bout-coupé, 1 very small chert core, 9 flint flakes associated with the making of bifaces, 2 denticulates made on chert, and 11 pieces of debitage on chert and flint.

In my sample I included 14 pieces of the early collections, now housed in the Oxford University Museum and 22 pieces from the recent Jacobi and Hawkes excavations (1993), from the Victorian spoil. The latter artefacts came from the deposits that Dawkins was excavating, but were missed by Dawkins. This should be expected, if we take into account the fact that most of the work in the cave was conducted with candles being the only source of light. The other 13 Middle Paleolithic artefacts of the original assemblage are dispersed in various other museums and were not examined, due to time restrictions. For these artefacts I rely on the descriptions of Tratman *et al.* (1971).

All the artefacts are in a mint condition, and the assemblage seems to be *in situ.* There are three raw materials used in the assemblage, grey carboniferous chert, grey flint, and grey carboniferous limestone. Chert is the most common material. Flint was also quite often used, taking into account the part of this assemblage that has not been examined by the author, while there are only two artefacts made on limestone. The use of pebbles in both flint and chert is attested in my sample by the presence of alluvial cortex on artefacts from these two materials. These pebbles were probably picked up locally. This is certain for flint, as there is one flint pebble in the collection in the Oxford University Museum collected during the Dawkins' excavations in the cave. There is no cortex on the two limestone artefacts, but these are probably also of local origin, since carboniferous limestone occurs in deposits of this area. I do not present here any quantitative assessment of the numbers of cortical and non cortical artefacts, since I have only examined half of the early excavation collections. Table 12 is a summary of the artefacts examined in this sample.

It seems that there was a preference for the production of debitage on chert as is shown by the fact that all the cores and most of the flakes are made on this material. Accordingly, most of the retouched tools are made on chert. These are predominantly notches and denticulates, in one occasion combined on the same blank. In another occasion a scraper was combined with a denticulate. There are only two side scrapers, one whole on chert, and one fragment on flint. There is also one end-scraper on chert. It seems that flint was mainly used for the making of handaxes, as is seen by the handaxe and the handaxe thinning flakes in this sample, but also by the others mentioned in Tratman *et al.* (1971). In the same report a few pieces of debitage on flint are mentioned. Limestone is represented in my sample by two flakes, one of which may be associated with handaxe manufacture (Oxford University Museum, s.432, 21), but this attribution cannot be regarded as certain.

The evidence for making/sharpening handaxes and using them in the cave is a possible indication that heavy duty butchery occurred on site. This would be consistent with the attribution of Hyaena Den to the kill/butchery site category of my site typology. Such an interpretation is corroborated by the identification of cut-marks on a red deer incisor (Hedges *et al.*, 1996). On the other hand the presence of notches, denticulates, and the scrapers might be an indication of woodwork, associated with the making of spears, which we would expect to find in food consumption/resources processing sites, and rest/recreation/observation sites, where the preparation of hunts would occur. The location of the site in a cave at the sheltered bottom of a valley and the evidence of fire point more to an attribution to the former category, where Neanderthals would have spent the longest periods of time, as proposed in this thesis. This is also supported by the retouch spalls and sharpening flakes recently discovered by Jacobi and Hawkes (1993), which indicate retouched tool making and maintenance in the cave.

In such a case the consistent evidence for butchery on the site should be interpreted in an alternative way. It is possible that Hyaena Den is a combination of kill/butchery sites (type b), and sites where Neanderthals spent longer periods (type c). The key might be the identification of cut-marks on red deer remains. Red deer was to be found only in the south-west area of Britain during MIS 3. Although we know that Neanderthals usually subsisted on big herbivores, like mammoth and rhino, they also took other smaller prey, when it was available (e.g. Lynford).

	Raw material			
Artefact type	**Chert**	**Flint**	**Limestone**	**Total**
Core	4	0	0	4
Denticulate	1	1	0	2
Denticulate and notch	1	0	0	1
Scraper	2	0	0	2
Flake	13	1	1	15
Flake fragment	1	1	0	2
Handaxe	0	1	0	1
Handaxe thinning flake	0	2	0	2
Notch	4	0	0	4

Scraper fragment	0	1	0	1
Scraper with denticulate	1	0	0	1
Possible handaxe thinning flake	0	0	1	1
Total	27	7	2	36

Table 12: Artefacts made on diferent raw materials in the Hyaena Den assemblage (Pers. obs.).

Subsistence on smaller prey would change the variables used to devise my site typology, in the sense that it might have been possible for groups of Neanderthals to carry whole carcasses away from kill sites and butcher them in more protected places. In such a case, we would not expect to find any significant archaeological signatures of kill sites, except from the odd broken Mousterian or Levallois point, in the form of isolated finds. In addition to this, evidence for butchery would be expected to be found in the resources processing/ food consumption sites. Finally, the possibility that some observation of the surrounding area occurred from the top of the hill above Hyaena Den cannot be completely ruled out. If this were true, Hyaena Den would be a unique example, where all three types of sites described in this thesis could merge in one. All this indicates that the typology use in this thesis is bound to be affected by regional considerations. This will be discussed in more detail in the final chapter of this thesis.

I mentioned the possibility that the sheltered wooded valleys of the south-west of Britain could have played the role of a winter refugium for Neanderthals and other animals, during MIS 3. In harsh climatic conditions, the use of a sheltered site as a home base, where different site functions could be combined, might have been imperative. The possibility that Neanderthals were spending relatively long periods in this cave is supported by the evidence for re-tooling discovered by Jacobi and Hawkes (1993). In the model proposed in chapter 2, a maximum of 15 days was identified as the longest period that Neanderthals would stay in the same place. It is possible though that in cases like Hyaena Den this limit would have been exceeded, resulting in a more sedentary Neanderthal lifestyle.

In terms of hunting, a decrease in resources, due to harsher conditions, would have justified their choice to hunt smaller animals, like red deer, available in this region. If indeed groups prepared for the hunt in Hyaena Den and returned there to butcher and eat the killed animals, it may be possible to view Hyaena Den as the closest example to the *central foraging model* paradigm, within the archaeology of this period in Britain. Such behaviour would probably require shorter foraging distances, possibly closer to the lower end of the spectrum described in the previous chapter. The use of strictly local materials is consistent with this idea. The wooded habitats in the surroundings of the cave might have been the actual limits of the Neanderthal foraging trips.

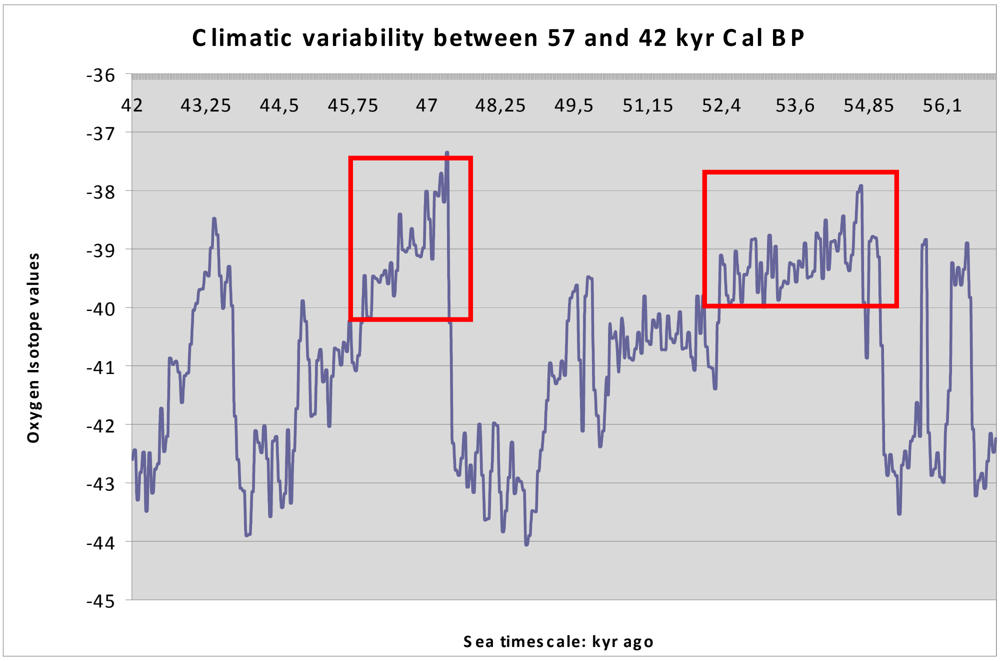


Figure 40: Graph showing climatic variability 57-42 kyr ago. Two "mild episodes" are indicated with the red boxes. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

AMS dating on the cut-marked red deer incisor produced a date of 40,400 +/- 1, 600 for the Hyaena Den assemblage, but this is now considered to be an underestimation (Jacobi *et al.*, 2006). This is a very important specimen, since it is definitely associated with human presence. Hopefully its re-dating with the new method of ultrafiltration will provide some precision for the chronology of the Hyaena Den Middle Palaeolithic archaeology. Meanwhile, new AMS dating on bone, with the use of ultrafiltration, from the same deposits, produced dates between about 48 and 45 kyr ago for the Hyaena Den archaeology and a date of 52, 700 +/- 2000 at lower than the archaeology levels. Due to the fact that the latter date is closer to the limits of the Hulu method it is difficult to get a reliable calibrated result. The three dates actually related to the archaeology, if calibrated give a range between 57 and 44 kyr ago, and in this sense the archaeology of Hyaena Den could be related to any of the two mild episodes that have been related to the occupation of Robin Hood Cave (Figure 40).

3.3. A summary and discussion of the data and their interpretation.

Summarising the archaeological information presented above, the following patterns can be observed. The sites of this period can be attributed to three categories, according to the dating evidence. The first concerns the initial re-colonisation of Britain in MIS 3 and is represented by Lynford. The occupation in Lynford happened in the transition between MIS 4 and 3 and this site may be an indication of the first expeditions of Neanderthals in the British Isles for this period. The fact that the activities at the site are possibly associated with mammoth hunting may be an indication that Neanderthals' return to the area of Britain was a result of their habit of following mammoth herds, during seasonal migrations. Neanderthals would have probably arrived in Britain together with all the other elements of the "mammoth steppe", of which they also constituted an integral part. Another important element of this type of fauna was the hyaena, which seems to be somehow associated with all the Neanderthal sites examined in this chapter. It is possible that Neanderthals at this stage had managed to occupy a very specifc niche within this steppic fauna. This was a niche of a predator subsisting on big size herbivores and was one that not even their closest rival predators had managed to occupy. The location of the site in East Anglia is a possible indication for an arrival of Neanderthals from the East.

The second category includes the two Creswell sites mentioned, as well as Hyaena Den in Wookey. These sites seem to date in a later period within MIS 3, a bit before or after 50,000 yr ago. In both Creswell and Wookey Neanderthals seem to have explored wider territories within Britain and to have reached a considerable distance inland. It is natural that these areas with the karstic limestone formations, when discovered would have been considered as preferred habitats, due to the advantages they offered in terms of sheltering needs. It has been proposed in this thesis that this part of Neanderthal occupation is related to three "mild episodes", two of which are of greater intensity and longer duration than the one witnessed in

Lynford. This could mean that these two episodes witnessed higher temperatures than the ones inferred for Lynford by the beetle assemblage and for longer periods of time. This may have been the main reason why Neanderthals were able to explore larger territories, reaching as far north as Creswell Crags.

Finally there are the sites of Kent's Cavern and Oldbury for which there are no absolute dates associated with the archaeology. The exact time of occupation for these two sites will remain unknown, and it is equally possible that they were occupied either in the earlier or the later period of Neanderthal occupation. Their position near the modern coastline may be an indication that like Lynford they are the first attempts at re-colonisation of Britain, but no definite answer to this problem can be given at the moment.

In any case judging from the dating information from the sites of the two first categories, it seems possible that the MIS 3 Neanderthal occupation of Britain happened in at least two separate time periods, one in the transition between MIS 4 and 3 and a later one, possibly around 50,000 years ago.

In terms of the proposed model of Neanderthal occupation happening only in the warmer episodes of MIS 3, there is no hard evidence to support such a theory. The general character of the archaeology of the period supports small scale, intermittent occupation for short periods, but this is as far as it goes. There is no possibility to match the averaged environmental information of the sites with the fine resolution environmental curve of NGRIP. The lack of intensity in the occupation of caves is in favour of a warmer climate, but on the other hand there are no excavated open-air sites of a more residential character which would give us the opportunity to make direct comparisons. The problems with the calibration of ^{14}C dates in the period prior to 26,000 calendar years ago are a weakness in this model. For now the attributions of sites to specific "mild episodes" in the NGRIP curve can only remain tentative and should be viewed more as a heuristic tool than a conclusive interpretation

As far as the site-typology proposed, it seems to have proved a quite useful methodological tool. Sites of all three types have been identified, and where the identification was rendered difficult by a combination of site formation processes and excavation history, the site-typology provided ways of investigating different interpretations. In this sense, it is a useful heuristic device. A possibility to amend the site typology was presented in the archaeology of the Hayena Den, where at least two types seem to merge in one. This is just an indication of how complex Neanderthal archaeology can be and the limitations of any formal and inflexible typology. My choice of the specific, distinct types, described in chapter 3 was made keeping in mind the most up to date information on Neanderthal diet. Given that Neanderthals were mainly subsisting on big animals it was reasonable to assume a separation of the heavy duty butchering activities from sites with a more residential character. The fact though that they subsisted mainly on big animals does not mean that they did not take smaller prey, when this was available. This could result in the transfer of heavy duty butchering activities to sites of a more residential character, reducing the typology to only 2 basic types. As seen in the case of Hyaena Den this shift in hunting strategies could have been related to the migration of Neanderthals to areas of a refugium character and the practising of some kind of residential mobility. This is a new parameter that has to be taken into account, when investigating sites from the other areas of Western Europe.

Regarding the question of a specific meaning for the use of bout-coupé handaxes during this period in Britain no significant patterns have been observed. Bout-coupés occur in all types of sites, where other types of handaxes occur. The absence of bout-coupé in Robin Hood cave is interesting, but due to the complex nature of this assemblage, a large part of which seems to be missing, no inferences can be made. Bout-coupés might have had a specific significance or function, but it is impossible to investigate it within the presently used framework of landscape use and site function.

The approach followed in this thesis can be a useful tool for designing new research in the Late Middle Palaeolithic of Britain. Using a model that tries to understand every site, within a landscape including other synchronous sites, it provides the basis for a new research design. In none of the cases of the sites described has it been possible to connect them with other excavated sites in the same area and securely dated to the same period. Surveys and subsequent excavations in the periphery of the existing sites and within the limits of Neanderthal ranges as predicted by Steele (1996) might prove fruitful in the future and this is where this model will be actually tested.

Although this approach has not produced a definite explanation for the archaeological data of this period in Britain, it has certainly highlighted several issues for discussion. These are the degree to which different sites can be regarded as contemporaneous, and the degree to which the assemblages surviving in museums today can be considered as accurate representations of past events, during the Palaeolithic. Moreover this discussion has been led within a theoretical framework incorporating many elements, such as the concepts of time and synchronicity, subsistence behaviour and mobility, tool use and site function.

CHAPTER 4: THE LATE MIDDLE PALAEOLITHIC IN BELGIUM

4.1. Introduction

Belgium can justifiably claim to be one of the cradles of Palaeolithic research in Europe. It was one of the places, together with Britain and France, where, during the 19th century, pioneer researchers set out to demonstrate the association of humans with extinct animals in cave deposits. More specifically, Belgium has been connected with great discoveries in the field of Neanderthal studies. All this research was focused in the valley of the Meuse, in the south of the country, where the limestone karstic formations played their usual role, as sedimentary traps that preserved the remains of ancient activities.

In 1829-1830 Ph.-Ch. Schmerling discovered the first Neanderthal remains in Belgium in the Engis cave. The significance of this discovery, which occurred well before the publication of the “Origin of species” (1859) and the discovery of the Neanderthal type specimen in the Neander Valley (1856), was not fully appreciated, as the bones were not correlated with an archaic human form. Their Neanderthal character was only recognised a hundred years later. In the course of the same century more discoveries of Neanderthal fossils were made. In 1866 Ed. Dupont discovered in La Naulette the famous Neanderthal mandible, while 20 years later Max Lohest, Marcel De Puydt and Julien Fraipont exhumed the remains of the “Man of Spy”. The last great fossil discovery for that century came in 1895, when F.Tihon discovered the Neanderthal femur in Fonds de Forêt. It was because of the zeal of those pioneers, and their followers during the first half of 20th century that very few deposits were left unexcavated and available to the scrutiny of the modern scientific method. One of these rare cases is Scladina cave that was only discovered in 1971, and has produced Neanderthal remains, while a Neanderthal pre-molar was also discovered from another modern excavation in the Walou cave between 1985 and 1990 (For a more detailed account of the history of Neanderthal research in Belgium, see Toussaint, *et al.*, 2001).

A fruit of the fossil fever of the 1800’s, along with the discovery of Neanderthal bones, was also the discovery of Neanderthal archaeology. Neanderthal stone tools were found either in the same sites as the fossils, though more often than not in different layers, or in other cave sites of the same region (Toussaint *et al.*, *ibid)*. Investigations from the 1960's onwards mainly in cuttings produced by quarries in the north-western, north-eastern and central part of the country enriched our knowledge of the Belgian Middle Palaeolithic, adding open-air sites to the equation (Michel, 1978, Michel and Haeserts, 1975, Van Peer and Smith, 1990, Van Peer, 1986, Van Peer, 1982). Today we know that Belgium has possibly been occupied by hominins, at least since MIS 7, as is shown by the dating of Mesvin IV (Van Peer, 2001). The main periods of occupation though are during MIS 5 and MIS 3, with a possible abandonment of the area, during MIS 4 (Van Peer, *ibid*).

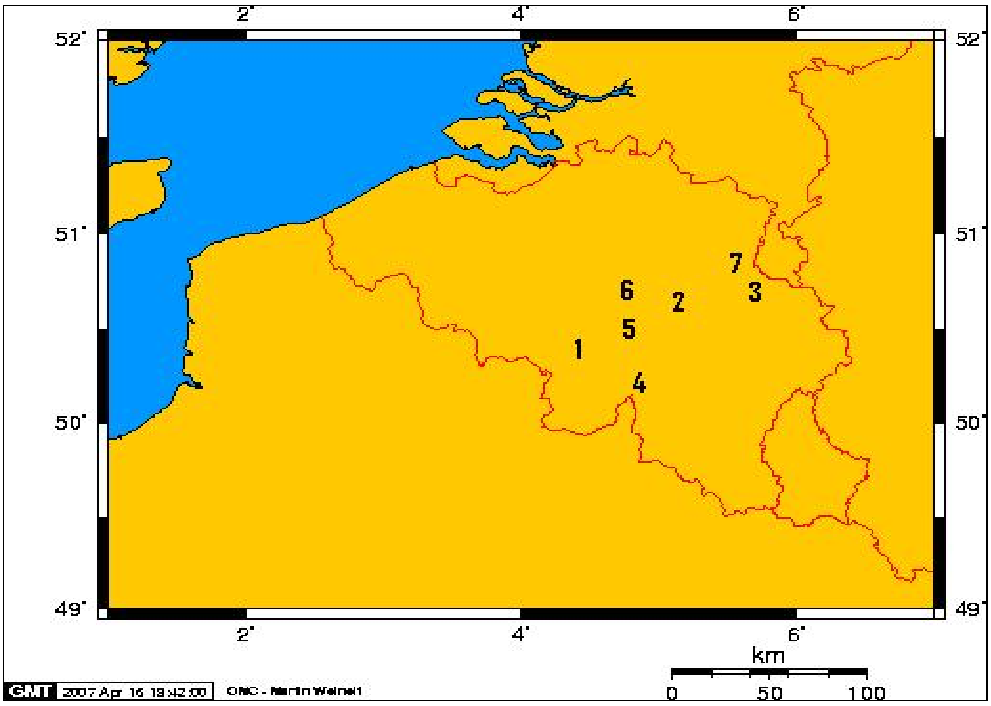


Figure 41: MIS 3 Middle Palaeolithic sites in Belgium. 1. Spy, 2. Engis, 3. Fonds de Forêt, 4. Trou du Diable, 5. Scladina, 6. Trou Wallou, 7. Veldwezelt-Hezerwater.

The MIS 3 Middle Palaeolithic occupation currently seems to consist of 7 find spots in the Meuse basin and the adjacent area. Six of these are cave sites, while open-air sites definitely associated with this period, have only been identified in one location. The cave sites situated along the Meuse have in general produced mixed Middle and Upper Palaeolithic assemblages similar to the ones in the UK and due to the lack of knowledge of precise stratigraphic associations cannot be of much use today. These are the two caves of Spy (Figure 41.1), the caves of Engis (Figure 41.2), and Fond-de-Forêt (Figure 41.3). Very recently, typological studies of the assemblages of Spy have been undertaken but no further clarification of the stratigraphy has been proposed (Jungels et al., 2006). Only three cave sites from this period have survived with Middle Palaeolithic occupations clearly associated with MIS 3. These are Trou du Diable (Figure 41.4), Scladina (Figure 41.5), and Trou Walou (Figure 41.6). The latter is currently under publication and the results are awaited. The other two, for which information is available, will be presented in this chapter. They will be discussed in conjunction with the site of Veldwezelt-Hezerwater (Figure 41.7), which is the only open-air site in Belgium, dating with certainty to MIS 3.

4.2. Scladina

The cave of Scladina is located at the village of Sclayn, which is on the right bank of the river Meuse between Namur and Liége. The cave is part of a karstic complex on a slope overlooking what is today a dry river valley (Otte et al., 1983). Figure 42 is a ground plan of the cave. The cave entrance opens to the east and this would have made it a favourable location for habitation by hominins during the Last Glaciation, as it would have offered protection from the cold North-Westerly winds that would have prevailed in cold periods of MIS 3 (Barron et al, 2003).

The cave was discovered in 1971 by the members of the “Archaeological Circle of Sclayn”. During the following years, the blocked entrance was cleared and excavations were initiated. Systematic excavations were started by the University of Liége in 1978 (Otte *et al.*, *ibid*), under the direction of Professor Marcel Otte. In 1991 the direction of the excavations was taken over by Dominique Bonjean. The excavation at Scladina is ongoing and it is the only Palaeolithic site in Belgium that is excavated the whole year round. In the summer months it is used as a field school for the students of the University of Liége. These days, the team working permanently at Scladina is composed of three archaeologists, a conservator and three expert workers. The Pleistocene stratigraphy of the cave (Bonjean, 1998) is shown in figure 43.

a) Layer 7B is the first layer resting directly on the bedrock of the cave. It is mainly composed of quartz and quartzite pebbles, which derive from the remains of an old terrace of the Meuse. It was deposited as a result of water action (Gullentops and Deblaere, 1992).

b) Layer 7A is composed of angular limestone cryoclastic material in a silty matrix.

c) Layer 6 is composed of silt and contains a small quantity of cryoclastic material. It probably attests to a period of movement of sediments from the outside towards the inside of the cave. About thirty artefacts, made on quartz and flint, were found at the top of this layer, but these probably derive from the overlying layer 5, as a result of vertical movement.

d) Layer 5 contains a great quantity of cryoclastic material (60-70%) in the form of angular blocks. It also contains the greatest quantity of lithic artefacts in the cave. It has been dated by thermoluminescence to about 130,000 years ago.

e) Layer 4B is a silty layer of yellowish colour with dark spots in places. It seems to be the result of sediments that were initially deposited by winds and then transported into the cave. It contains 5 flakes made on flint and 4 pieces of debris on quartz. Again the presence of these artefacts is interpreted as the result of vertical movement.

f) Layer 4A is composed of homogenous silt of reddish colour and it contains numerous fragments of stalagmite fragments and limestone slabs, which are often found in vertical and horizontal positions. It is thought that this layer is the result of rapid influx of sediment in the cave. Layer 4A contained the bones of a Neanderthal child.

g) CC4 is a stalagmitic layer that marks the end of the Last Interglacial and the beginning of the Last Glaciation.

h) Layer 3 is rich in cryoclastic material and marks a period of roof collapse. Three human teeth were recovered from this layer.

i) Layer 2B constitutes a micro-soil of dark grey colour containing organic material.

j) Layer 2A is the same as layer 3, containing a great quantity of cryoclastic material.

k) Layer 1B is characterised by the presence of horizontal limestone slabs in a significant quantity of matrix (70%). There is an apparent decrease in the cryoclastic activity in this layer. It contained four human specimens.

l) Layer 1A is constituted of cryoclastic fragments of a fine nature and big angular fragments deriving from roof collapse episodes. It contains the second largest lithic assemblage of Scladina and a rich faunal assemblage that has been dated by C^{14} to around 38, 560 years ago.

m) Layer 40 is a thin yellowish layer, indicating chemical action during a period, when then are no indications for frost action.

n) Layer 39 is constituted of fine cryoclastic material.

o) Layer 38 and 37 are the last layers containing cryoclastic material in the cave. Layer 38 contains a greater quantity of silt and some artefacts dating to the Upper Palaeolithic.

p) Layer 36 constitutes the last layer of Pleistocene deposits. It is composed of silt and is disturbed by animal activities.

q) Finally CC1 is a stalagmitic layer marking the advent of the Holocene.

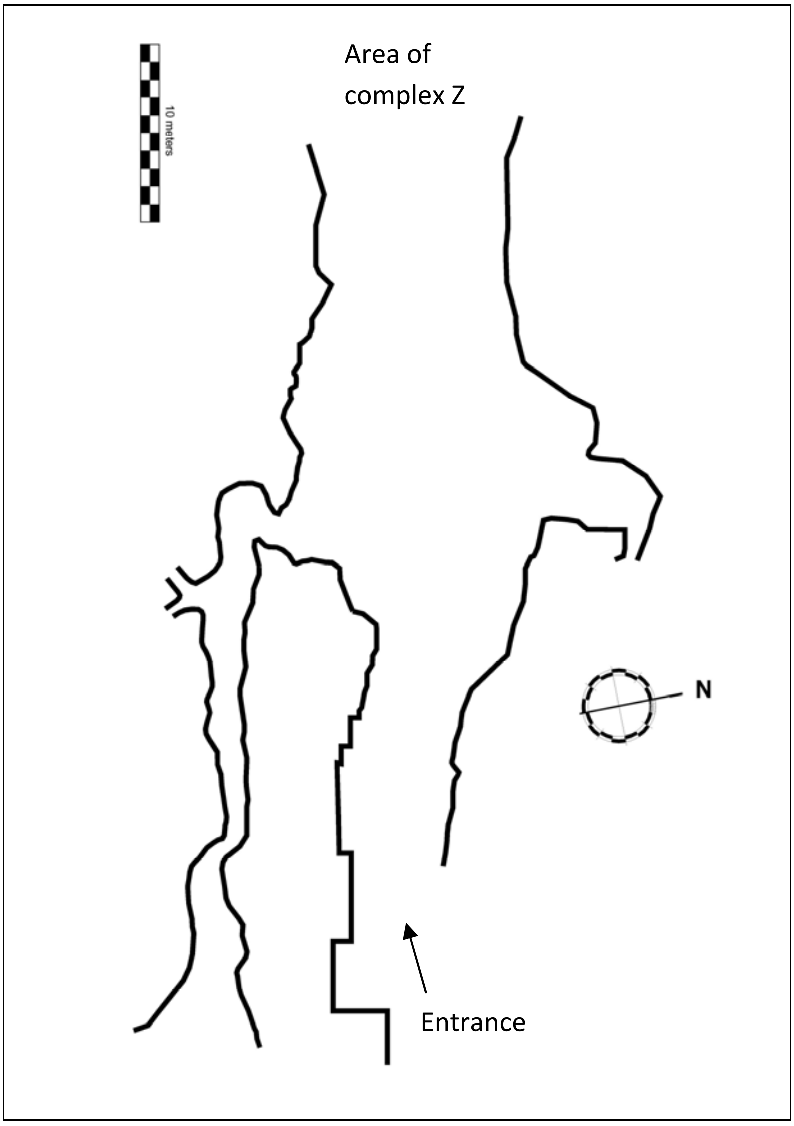


Figure 42: Ground plan of Scladina. Redrawn by Aggeliki Zacharia and Babis Garefalakis.

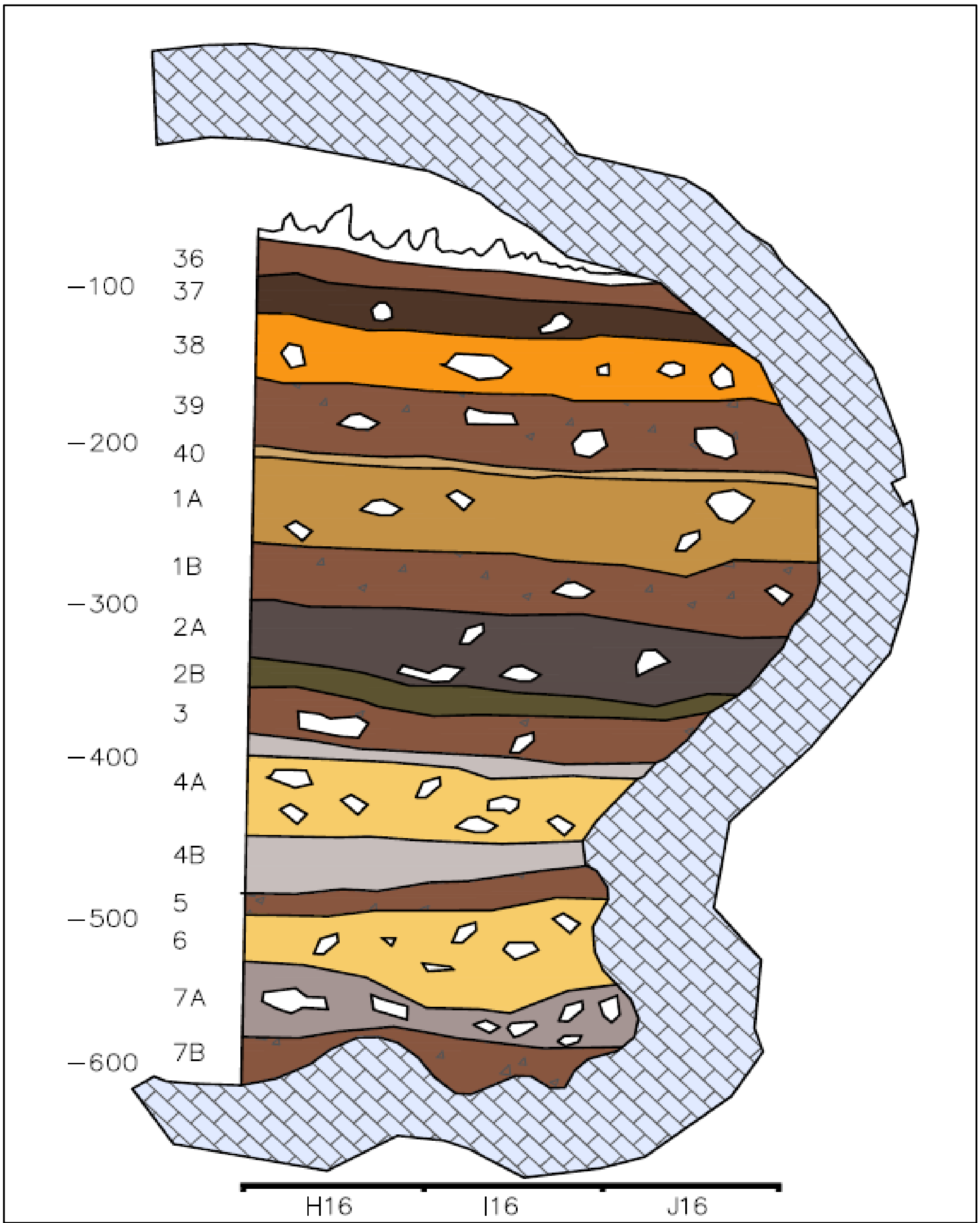


Figure 43: Stratigraphy of Scladina (Bonjean, 1998a). Redrawn by Aggeliki Zacharia.

Layer 1A was chosen to be examined in this thesis on the basis of its chronology. It can be placed in MIS 3 by a series of absolute dates. The C^{14} date of c. 38,560 uncalibrated BP (L.V. 1377 bis) obtained with a conventional method on bone collagen is probably an underestimation of the real age of this layer. Other dates obtained from this layer have given results of >36,200 years ago (Uncalibrated C^{14} date on bone collagen), >36,000 years ago (U/Th date on calcite), >40,000 and <60,000 years ago (U/Th date on calcite) and finally 44,000 +/- 5,500 years ago (TL date on burnt flint) (Bonjean, 1998a). This latter TL date will be taken here as the main indicator for the chronology of the layer that will be considered to be somewhere in the range between 50,000 and 40,000 years ago, an estimate that in no way contradicts the rest of the absolute dates.

In the past few years, new work on the geology of the cave undertaken in the course of a doctoral thesis has shown that the main stratigraphic units described above can sometimes be further sub-divided into even smaller layers (Pirson et al., 2008). According to these new subdivisions layer 1A can be divided in two layers, 1A-GK and 1A-GL. 1A-GK the lower level and the one that takes up the greatest thickness of this sedimentary unit contains the greatest bulk of the archaeology. Some archaeology is also found in layer 1A-GL, possibly re-worked from the underlying layer.

Layer 1A has been identified at the plateau outside the cave (Haeserts, 1992), which was possibly sheltered before the cave roof collapsed at some point. In the interior of the cave it is found in an area, starting at the current entrance and reaching about 24 m towards the back of the cave (Figure 42). The geometry of this layer points to an introduction of its sediments through the entrance of the cave. In 1995 a new sedimentary complex was identified at the back of the cave, about 9 metres further from the point that layer 1A stopped. This new complex was named Z. It was the result of introduction of sediments in the cave via a different route, namely a chimney that existed in the roof at this area. The interesting part is that one of the layers in this complex, Z6, contained small faunal and lithic assemblages, which were quite similar to the ones from layer 1A (Bonjean et al., 2002). An association of the lithic artefacts from layers 1A and Z6 has now been established through refitting artefacts from these two layers (Mathys, 2006-7). This interconnection shown between artefacts that have occurred in these two sedimentary units of originally different origins is quite significant and will be discussed below in relation to the position of the artefacts in 1A, and to the degree that these artefacts can be considered to be *in situ* or derived.

As with most of the layers of Scladina, 1A has derived from the re-working of loessic sediments that accumulated outside the cave entrance and then were moved through the process of solifluction inside the cave. There, they were mixed with material that fell from the roof as a result of frost action (Pirson *et al.*, 2008). All the processes related with the formation of layer 1A point to a very cold environment. The accumulation of loess outside the cave should be linked with the carrying of dust by the cold northern winds. The process of solifluction, which is related with the slow downslope displacement of sediments, can be linked with two processes related to ground ice formation: frost creep and gelifluction (Bertran, 2004). Finally, the incorporation of broken limestone material from the roof of the cave in the layer also points to very cold conditions. The fact that these formation processes occur throughout the layer 1A will be taken here to mean that this layer was formed during constantly cold conditions. On the other hand, the fact that this layer can now be sub-divided in smaller sedimentary units will be interpreted as an indication for a possible palimpsest effect, witnessed in this sedimentary unit. In this sense it cannot be ruled out that layer 1A was formed in more than one cold episode. With the existing data there is no indication that these cold episodes might have been interrupted by a climatic amelioration.

Recent pollen analysis for this layer has shown high concentrations of pollen from steppe herbs, while the arboreal pollen does not exceed 5%. More specifically the presence of herbs like *Hippophae, Ephedra and Helianthemum* indicate really harsh conditions (Pirson, *et al.*, 2008). A possible interpretation for this is that during this very cold period there was a largely open environment in the surrounding area of the cave. The small percentage of arboreal pollen identified could be linked with the persistence of some tree populations that would probably have had the form of small woodland patches scattered around the landscape. This should hardly be a surprise, given that the area of the Belgian Ardennes has been identified as a “cryptic northern refugium” (Stewart and Lister, 2001), meaning an area, where populations of plants and animals would be able to survive generally harsher conditions than they normally would in other areas of the same latitude.

In terms of the animals found in layer 1A no evidence for micro-fauna has been identified to date (Cordy, 1992). In contrast there is a considerable assemblage of large mammal bones (Simonet, 1992). The faunal assemblage confirms the association of a largely open environment with some evidence for woodland. From the herbivore species associated with open environments, the most common is wild horse (42.4%), followed by the bovines (19.2%). Woolly rhinoceros takes up 12.6 %, reindeer 5.4 % and woolly mammoth 4.2 % of the totality of the assemblage. In much smaller numbers we also find giant deer (1.2%) and steppe ass (0.4%). Animals usually associated with closed environments that have been found in this layer are red deer (8.2%), roe deer (1.4%) and wild boar (0.4%). Finally, carnivores identified in this layer are cave bear, which seems to have been a habitual occupant of the cave, cave lion which occurs more sporadically and also panther and spotted hyaena. To this date no information is known about the taphonomic history of this bone assemblage. A taphonomic study is currently underway by Marylene Patou-Mathis and results are awaited.

The collection of lithics from layer 1A that I examined includes a small quantity of artefacts from layer 40. During the most recent excavations in the remaining sediments of the upper part of the Scladina sequence, it has become apparent that these artefacts were originally in layer 1A and were later re-worked in the overlying sediments (Di Modica, pers. comm., 2008). The assemblage contains 3300 artefacts and has been previously reported in various papers (Loodts and Bonjean, 2004, Loodts, 1998, Moncel, 1998).

In my own examination of the assemblage I tried to record the biggest sample possible in the available time. This resulted in the recording of c. 11% of the totality of the artefacts present. The artefacts were stored in boxes and classified according to raw material. Thus, by recording 11% of each box, the resulting sample was proportionate to the raw materials used in the assemblage. To ensure that my sample would be proportionate in relation to the types of artefacts that existed in the assemblage, I used the following methodology. For each box the artefacts were taken out and divided in groups according to their type. 11% of each different type was recorded. In terms of artefact condition, the picture deriving from the above sample was cross-checked with the totality of the assemblage and it was shown to be a fairly accurate representation.

In the discussion of the site formation processes above it was made apparent that layer 1A was the result of the washing in of sediments from the entrance towards the interior of the cave. Whether the artefacts were originally deposited in the cave or immediately outside, it is not very clear; evidence from refits (Loodts and Bonjean, 2004 and pers. obs.) points to a movement of artefacts towards the interior of the cave. It is possible that towards the back of the cave some of the artefacts were incorporated in sediments coming from the roof opening there.

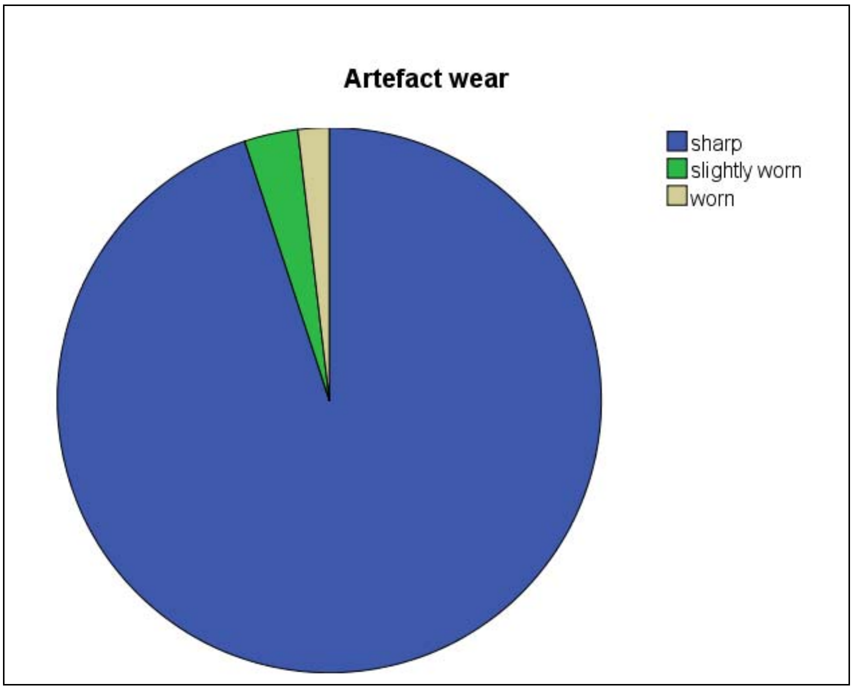


Figure 44: Condition of lithic artefacts in layer 1A (Pers. Obs.).

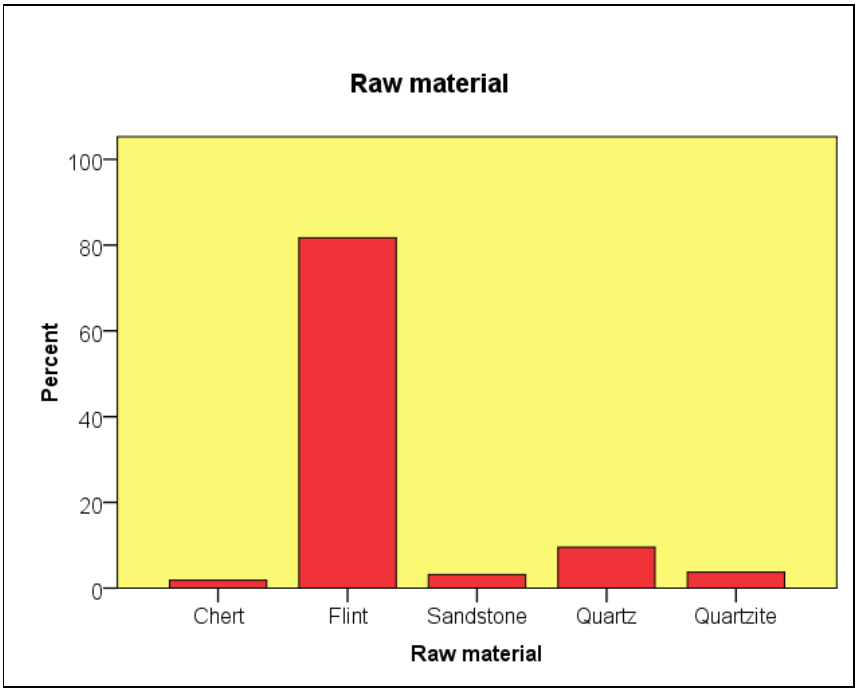


Figure 45: Frequencies of different raw materials used in the lithic assemblage of Scladina-1A (Pers. Obs.)

	Raw material					
Cortex type	**Chert**	**Flint**	**Sandstone**	**Quartz**	**Quartzite**	**Total**
Alluvial	0	171	6	0	8	185
Extremely worn	0	2	0	0	0	2
No cortex	7	93	5	35	5	145
Slightly worn	0	1	0	0	0	1
Very thin and smooth	0	0	1	0	0	1
Very worn	0	40	0	1	1	42
Very worn, reddish cortex	0	1	0	0	0	1
Total	7	308	12	36	14	377

Table 13: Type of cortex, identified on the artefacts from Scladina-1A (Pers. Obs.).

In this sense, an original occupation of the plateau in front of the cave or of the actual cave entrance seems quite likely. The fact that the artefacts would have only moved for a short distance is supported by their greatest majority (95%) being in mint condition (Figure 44). The possibility that this assemblage is a result of more than one episode of occupation cannot be completely ruled out. On the other hand, the presence of refits and the generally homogenous condition of the artefact indicates that if different episodes of occupation occurred, these would have been fairly close in time.

The assemblage was made on five raw materials (Figure 45), of which the most commonly used is flint (81.7%). The rest are quartz (9.5 %), quartzite (3.7%), sandstone (3.2%) and chert (1.9%). Quartz, quartzite, chert, and sandstone are known to occur locally in deposits of this area. Flint does not occur locally. In primary position it occurs in two areas; one is about 25 km north of Scladina, while the other is 75 km south-west of the site (Loodts and Bonjean, 2004). Due to the fact that no laboratory studies have been undertaken to tie the flint used in the cave to any of these two areas, it is difficult to take these associations for granted. On the other hand, there is good evidence for remnants of cortex of an alluvial nature on the flint (Table 13). Based on this I would consider it possible that it was picked up locally, in the form of river pebbles, at the nearby river beds or the ancient terraces of the Meuse, remnants of which have been identified in the vicinity of Scladina. Because there are no rivers flowing south in Belgium, it is more likely that the origins of this flint would have been in the area located south-west of the site. Indeed, the Meuse is flowing through that area and north-east, towards the site.

Table 14 gives us an idea of the different types of artefacts found in this assemblage, as these were recorded in my sample. The greatest majority of the assemblage (85%) consists of debitage, which includes evidence for the use of Levallois, discoidal and blade production techniques. The use of the first two techniques is also supported by the presence of cores of this type. Furthermore, there is some evidence in my sample for the maintenance of handaxes and the retouching of artefacts at the site. All the different techniques, mentioned above are used on flint, while only the discoidal technique seems to be used on quartzite (Table 15). In other words, Levallois and blade production are only evidenced on flint. It is possible that it would not have been necessary to apply these techniques on materials other than flint, given that they could get hold of great quantities of this much better quality material. On the other hand the fact that all different techniques are applied on flint points to the possibility that these techniques were not necessarily separate entities, but could possibly exist as different facets of the same reduction sequence, when the quality of the material allowed this. Evidence for the maintenance of handaxes exists on flint and chert, but the two handaxes found at the site are both made on flint. This could mean that handaxes on chert that were manufactured in other sites were repaired at Scladina and then transported elsewhere. One of the two handaxes is at the limits between a handaxe and a core; the other with a cortical butt and a working edge on one of its lateral parts is clearly a Micoquian handaxe (Debenath and Dibble, 1994). In general, the assemblage does not have a large retouched component. Only 7.7% of this sample includes retouched tools. The most common tool type is the scraper while there are also a few denticulates and notches, one piercer and one Levallois point. The general view from the tool component of the assemblage is that using tools at the site was not the main focus of Neanderthals’ activities. On the contrary the production of debitage seems to be the main activity that has taken place (Figure 46). With a great percentage of the assemblage consisting of pieces that retain at least some quantity of cortex on their surface (Table 13) it seems that what we see in 1A is possibly a largely *in situ* complete reduction sequence, starting from the initial decortication flakes of the pebbles and going through to more sophisticated flake or blade production techniques. This is further supported by the presence of a great quantity of chips and debris in the assemblage and also the presence of quartzite pebbles with signs of use as hammerstones. Quartzite can be considered a generally hard material and would have made a good hammerstone for the materials used at the site, including other quartzite pebbles.

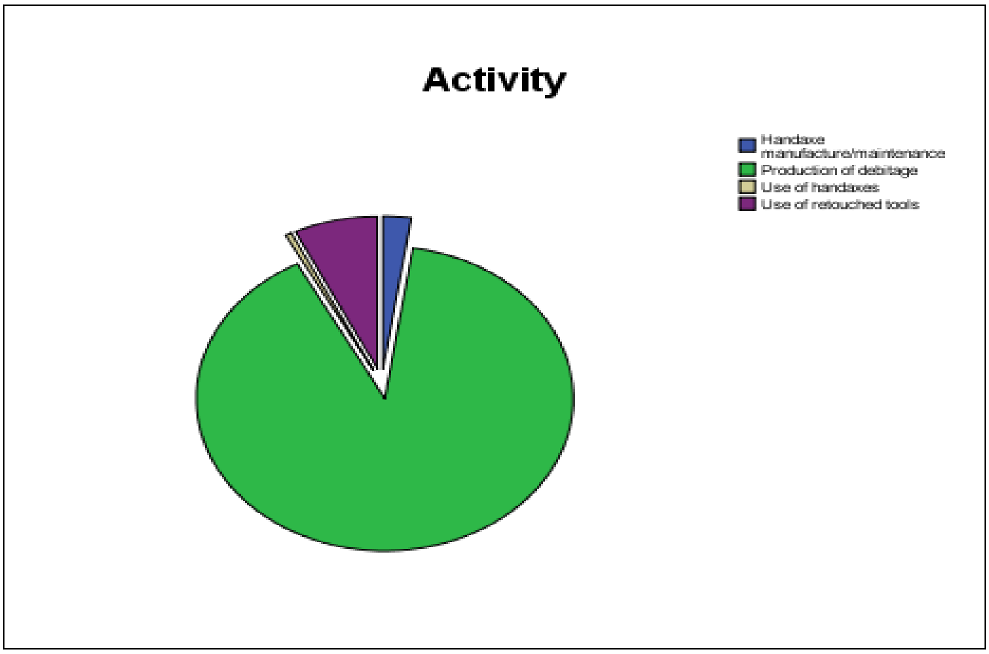


Figure 46: Frequency of the different activities performed at Scladina (Pers. Obs.)

If we try to bring together the evidence from layer 1A, with the aim to interpret the site within the explanatory model proposed in chapter 2 of this thesis, the following can be said. Neanderthals occupied the entrance or the area in front of the entrance in one episode or two or more episodes that were fairly close in time. It is not known to date if Neanderthals processed meat at this site, but it cannot be completely ruled out. The fact that the cave had been used in different periods as a lair by cave bears and cave hyenas could actually mean that the accumulation of bones was not related to the human occupation. Looking at the lithics, and given that there exist a few retouched tools and two handaxes in the assemblage, we could infer that there was some kind of processing of animal carcasses at times, but this was not the main activity. The fact that there is little evidence for maintenance of handaxes indicates that these implements were mainly used at other sites, possibly the butchery/kill sites, which must have existed in the surrounding area. It would be there that more intensive use of handaxes would have required them to be repaired.

On the other hand, the dominance of debitage in the assemblage could have been actually related to some kind of light-duty butchery, but any association of this kind had better wait, until the results from the taphonomic examination of the bone assemblage are known. In any case, taking into account the lack of convincing evidence for the systematic use of fire, which indicates a number of short duration occupations and the location of the cave at a place where it would have offered commanding views of the surrounding area, the association of this site with the *rest/recreation/observation sites* category seems quite likely.

In this context the emphasis on the production of debitage could be seen as a pastime, and a means of bonding for the hunting group, while at the same time it would result in the preparation of gear for the following hunting expeditions. The fact that handaxes were manufactured at the site and then transported elsewhere, possibly to *kill/butchery sites*, supports such an interpretation. Also, it is possible that more Levallois points were manufactured at the site but were hafted and transported elsewhere. Notches, denticulates and scrapers could have been used to prepare the spears, where these points would be hafted. An obvious move of the rest/recreation/observation sites from the tops or slopes of hills, as it was often the case in sites examined in the British Isles, closer to mouths of caves or even in the interior of caves can possibly be explained by the fact that Scladina was occupied in a very cold period. Given the harshness of the conditions, the lack of evidence for the use of fire at the site could either be related to the short duration of the occupations or with the fact that Neanderthals were dealing with a landscape, which was to a great extent treeless. Due to the diminished resources available, such an environment would have a significant effect on Neanderthals’ capability of lighting a fire, if they were not close enough to any given source of wood.

Type of artefact	**Frequency**	**Percent**
Amorphous core	19	5.0
Core on flake	1	0.3
Debitage	275	73
Debitage from artefact retouching	1	0.3
Debitage from handaxe maintenance	8	2.1
Denticulate	2	0.5
Discoidal core	3	0.8
Discoidal debitage	23	6.1
Scraper	19	5.1
Hammerstone	1	0.3
Handaxe	2	0.5
Levallois core	4	1.1
Levallois debitage	9	2.4
Levallois point	1	0.3
Notch	3	0.8
Other retouched piece	2	0.5
Pebble core	1	0.3
Piercer	1	0.3
Debitage from prismatic core	1	0.3
Split pebble	1	0.3
Total	377	100.0

Table 14: Frequencies of artefacts in Scladina-1A (Pers. Obs.

	Raw material					
Type of artefact	**Chert**	**Flint**	**Sandstone**	**Quartz**	**Quartzite**	**Total**
Amorphous core	4	13	0	2	0	19
Core on flake	0	1	0	0	0	1
Debitage	1	230	5	29	10	275
Debitage from artefact retouching	0	1	0	0	0	1
Debitage from handaxe maintenance	1	7	0	0	0	8
Denticulate	0	2	0	0	0	2
Discoidal core	0	3	0	0	0	3
Discoidal debitage	0	14	4	3	2	23
Scraper	1	14	3	1	0	19
Hammerstone	0	0	0	0	1	1
Handaxe	0	2	0	0	0	2
Levallois core	0	4	0	0	0	4
Levallois debitage	0	9	0	0	0	9
Levallois point	0	1	0	0	0	1
Notch	0	2	0	0	1	3
Other retouched piece	0	2	0	0	0	2
Pebble core	0	1	0	0	0	1
Piercer	0	0	0	1	0	1
Prismatic debitage	0	1	0	3	0	4
Split pebble	0	1	0	0	0	1
Total	**7**	**308**	**12**	**36**	**14**	**377**

Table 15: Crosstabulation of the different artefacts and the materials on which they occur (Pers. Obs.)

Now, in relation to tying the occupation of Scladina 1A to a specific climatic episode, the following observations can be made. We know from the data described above that the layer 1A of Scladina was occupied during a very cold period, when harsh conditions prevailed. We saw earlier in the text that thanks to the TL date obtained from this layer (44 +/- 5.5 kyr ago), we can place layer 1A in the period between 50 and 40 kyr ago. Figure 47 is a graph showing the climatic variability in this period.

According to the definition of cold episodes provided in chapter 2 of this thesis, there are 4 such periods occurring in the time frame between 50 and 40 kyr ago. Although the large margins of error in this absolute date cannot allow us to say with any certainty in which of these cold periods the Scladina occupation would have occurred we can attempt some speculation. The climatic cooling between 45.9 and 43.7 kyr ago seems to me as the likeliest one for two reasons. The first is that the mean of the TL date falls within this cold period and actually in its coldest part. The second is that this cooling follows the most significant warming (between c. 47 and 46 kyr ago) of this 10,000 years slice.

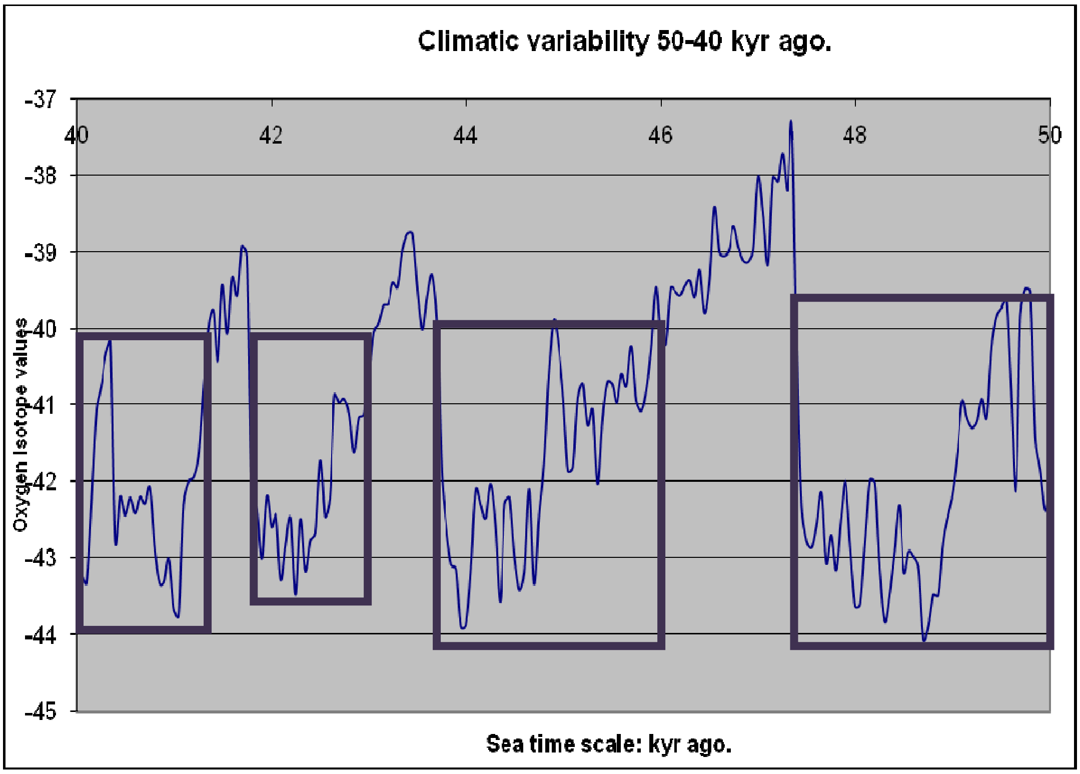


Figure 47: Climatic variability between 50 and 40 kyr ago. The episodes of climatic deterioration are marked. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

According to the reasoning followed in this thesis, it would be in such significant warming periods that Neanderthals would re-populate the area of Belgium from the south. In such a case, the population occupying the layer 1A of Scladina, during the cold period that followed could be understood as a remnant of the population that initially re-occupied Belgium. The possibility that an area such as Belgium would be able to retain Neanderthal population even in colder periods, during MIS 3, was already put forward in chapter 2 and was to a great extent related with the idea of northern refugia proposed by Stewart and Lister (2003). The layer 1A of Scladina should be seen as such an example when Neanderthals managed to survive the advent of climatic deterioration at high latitudes for a certain period. How long this period was, it is impossible to tell. It is obvious from the Scladina lithic assemblage that there was more than one occupation episode at the site. It is impossible to say though, in the course of how many years these episodes occurred. Moreover where did Neanderthals go every time they left Scladina? Did they occupy different areas and return later at the site, or did they perish and were substituted by different groups that were occupying other sites before? These questions seem really hard to even attempt to answer at the moment. We will get back and discuss them again in the final section of this chapter after presenting the evidence from the other two sites.

4.3. Trou du Diable.

The cave known as Trou du Diable is situated in the community of Hastiére-Lavaux on the left bank of the river Meuse. About 650 m away from the bank of the Meuse, at the point where its tributary Féron turns west there is a small ravine, known as the Fond de Tahaux. Trou du Diable is located on the limestone mass which takes up the east side of this small ravine. The cave, located only a few meters lower than the top of this limestone mass, faces north and opens up to a big plateau. It consists of two chambers, the one immediately after the entrance and one that opens to the left of it (Figure 48).

The site was first excavated in 1871 by Dupont (Dupont, 1872b, Dupont, 1872a), who conducted his excavations in the first chamber. Dupont only published basic information on the stratigraphy of the site and the faunal associations for each layer. More details on the stratigraphy uncovered by Dupont and the actual numbers of lithic artefacts in each layer were published by Rahir, based on the log kept by Collard, the chief excavator during the Dupont excavations (Rahir, 1925). The stratigraphy uncovered by Dupont consisted of five fossiliferous layers, numbered 1-5 from top to bottom. Only the three top layers were associated with evidence of human occupation, while the lowest two were the result of the use of the cave as a den by spotted hyaenas and cave bears. The first layer from the top started at a depth of 1.50 m from the surface and contained a big hearth and 500 stone artefacts. The second started at 2 m under the surface and contained another big hearth and 1,700 stone artefacts. The third started at 3.20 m from the surface and contained the remnants of a hearth and 600 stone artefacts. The criteria, based on which Dupont separated these three layers and assemblages are not known and this created a lot of confusion in the following years. As a result, the assemblages from these layers were interpreted in various ways starting from Dupont and followed by other researchers, during the first half of the 20th century.

Dupont attributed the assemblages found in these layers to what he named the layer of Hastiére and placed these occupations at the base of his stratigraphy for the Belgian Palaeolithic. Later on, Rutot attributed these assemblages to the Lower Aurignacian, which at the time was thought to represent an intermediate stage between the Mousterian and the Aurignacian, comparable to what is known today as the Chatelperronian (Rutot, 1910, Rutot, 1909). He based this attribution on the association of Middle Palaeolithic stone artefacts and artefacts made on bone. Rahir (1925) on the other hand attributed the third and lowest level to the Mousterian, and the second and first to the Lower and Middle Aurignacian respectively. Finally, Saccasyn-della Santa classified both the second and third levels to the Lower Aurignacian (Chatelperronian), on the basis of his identification of Chatelperron knives (Saccasyn-Della Santa, 1946)

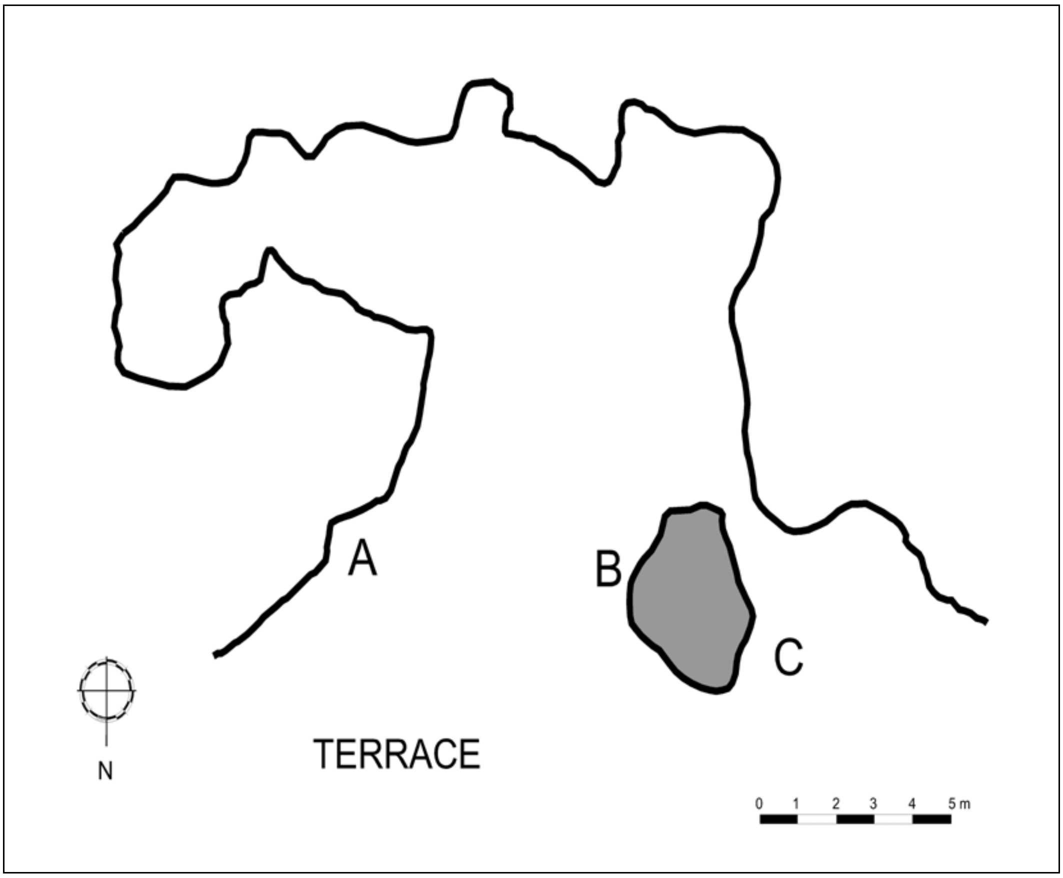


Figure 48: Ground plan of the Trou du Diable (Toussaint, 1988). Redrawn by Aggeliki Zacharia.

These attributions were to be re-evaluated in the 1960's and the 1970's, when the assemblages were re-examined in a more rigorous way, first, by De Sonneville-Bordes and later by Ulrix-Closset (Sonneville-Bordes, 1961, Ulrix-Closset, 1965, Ulrix-Closset, 1975). Both these researchers supported the existence of only two assemblages, one attributed to the Middle Palaeolithic and one to the Aurignacian. The assemblage from the second layer that had been thought to be transitional should be attributed, according to them, to an existing mixing of the two assemblages in the second layer, excavated by Dupont, or to errors that occurred later, during the storage of the collections in the Belgian Royal Institute of science. Of course, this resulted in the typology being the only instrument for distinguishing these two assemblages and in this sense any Upper Palaeolithic stone tool types that could have been originally included in the Middle Palaeolithic assemblage cannot now be recognised as such. The same goes for the bone artefacts deriving from these collections. Although, such a situation is quite unfortunate, we have encountered similar problems with the great majority of the lithic assemblages found in Britain and as we did in that case we will have to work with the information available. In any case, the possibility that the two assemblages were already mixed when excavated by Dupont seems quite likely, given that many post-palaeolithic burials were interred in the cave and this should have caused a considerable amount of disturbance in the already existing layers.

The theory of only two original assemblages, one related to the Middle and one to the Upper Palaeolithic, is supported by all the published excavation results that followed the work of Dupont. Gilbert-Louis excavated zone B (see Figure 48) of the cave entrance in 1950 and found in the same geological layer, composed of clay and limestone blocks, one Middle Palaeolithic and one Aurignacian assemblage separated by 50 cm of sediment (Gilbert-Lewis, 1952). Eloy excavated in zone A (see figure 48) in the period between 1951 and 1954 and found a Middle Palaeolithic layer with evidence of fire (Eloy, 1957). This layer which varied from 0.80 m to 1 m in thickness was composed by yellowish clay and numerous limestone fragments. It extended in all the excavated area and it was overlain by a sterile layer of 20 cm, above which there was a thin Aurignacian layer. Henry who excavated the cave in the period between 1957 and 1960, found in zone C (see figure 48) a Middle Palaeolithic layer again overlain by an Aurignacian layer.

The most recent excavations at the site took place in the period between 1978 and 1981(Toussaint, 1988) and produced similar results. The excavations took place at the plateau outside the cave and recognised amongst others two sedimentary units related to Middle Palaeolithic artefacts (Layer CRMA) and an Aurignacian occupation (Layer CARS) respectively (Figure 49). The layer containing the Middle Palaeolithic was composed of brown-reddish sediment, while the one containing the Upper Palaeolithic was composed of brown yellowish sediment. This latter excavation once more confirmed the proximity of the two layers. I believe that given all these data there is no doubt that only two assemblages were originally deposited in the cave. The reasons for the confusion that followed the Dupont excavations are possibly related to post-depositional mixing of the assemblages in parts of the cave. We saw that in certain areas the assemblages appeared to be part of the same layer, while in others they appeared to be in clearly separate units. It is possible that the limits between the two layers were not equally visible in the whole area that these layers extended. On the other hand the presence of post-Palaeolithic burials and the activities of burrowing animals, as indicated by the presence of badger bones in both the Middle and Upper Palaeolithic layers, could easily have resulted in the vertical movement of artefacts.

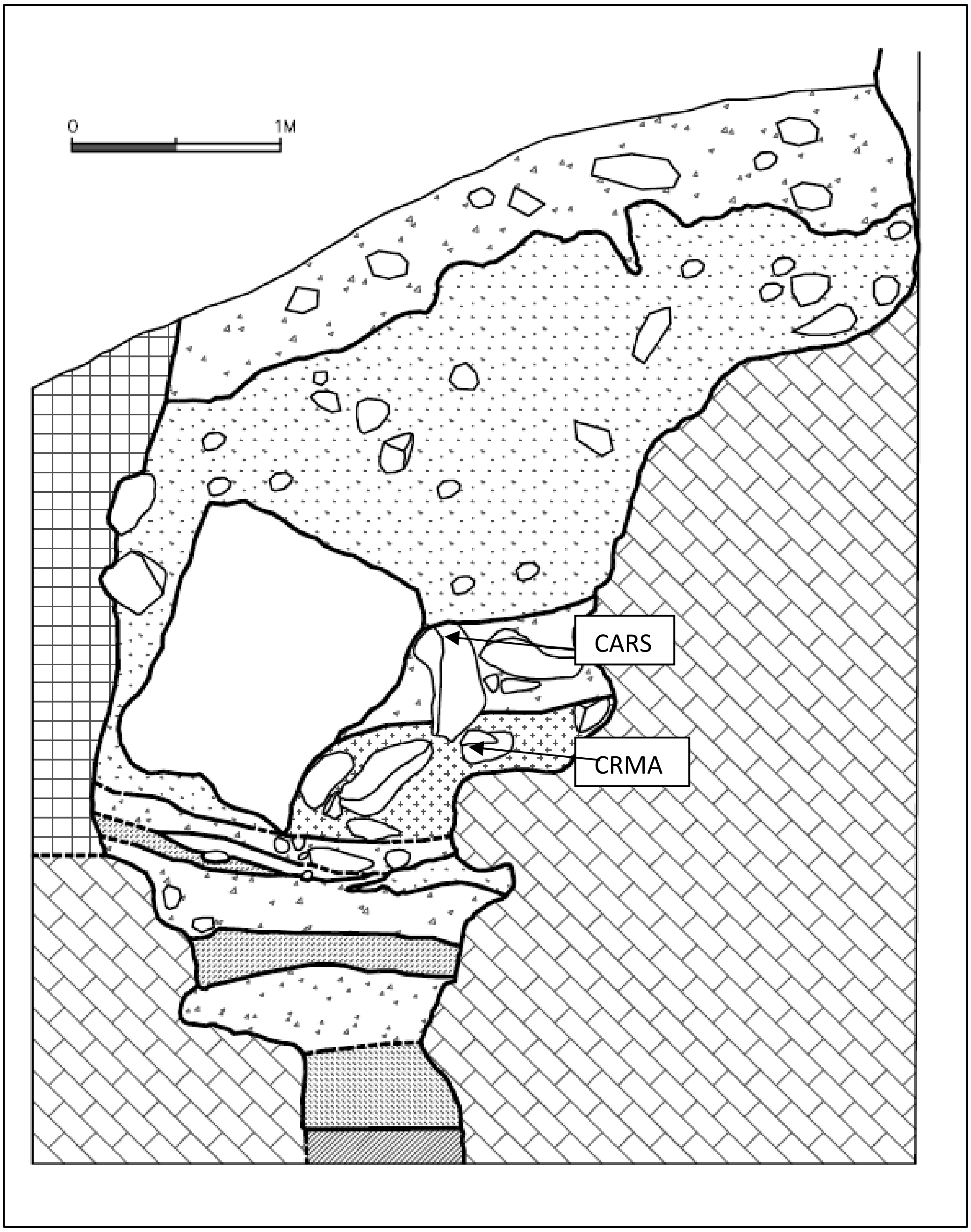


Figure 49: The stratigraphy produced in the most recent excavations of Trou du Diable (Toussaint, 1988). Redrawn by Aggeliki Zacharia.

The layer that is going to be examined here is the one that was recognised in most excavations as the Middle Palaeolithic layer, the equivalent of layers 2 and 3 of the Dupont excavations and recognised as unit CRMA in the most recent work undertaken in the cave. In order to understand the Middle Palaeolithic occupation of this layer, it will be necessary to bring together any information available from all the excavations conducted on various parts of its surface. Unfortunately the details concerning discontinuities of this layer and its exact sedimentary history are forever lost.

The attribution of this layer to MIS 3 can be made both on the basis of its proximity to the Aurignacian layer, but also on the basis of an absolute date obtained during the most recent excavations at the site (Toussaint, 1988). The date was obtained with the C^{14} method on bone and gave a result of 46,000 +2150 -1700 uncalibrated BP (GrN-14559). This date cannot be calibrated with CalPal due to the discrepancy between the plus and minus values. Due to the fact that this date was taken in the 1980’s before more sophisticated techniques for the removal of contamination were advocated, it will only be used here as a *terminus ante quem*. For this reason and taking into account the margins of error for the date, the Middle Palaeolithic occupation from the site will be considered to date in the period between c.60 and 44 kyr ago.

It seems from the various descriptions that the layer which contained the Middle Palaeolithic archaeology consisted of sandy clay and included in places great quantities of limestone fragments deriving from frost action. Although this evidence for cryoclastic material points to a cold period, it is not clear if we are dealing in this layer with the extremely harsh conditions that we encountered in Scladina, layer 1A. In the latter case there was cryoclastic material that had accumulated in sediment consisting of loess, which in turn had entered the cave as a result of solifluction. Given that the evidence from the sedimentology is inconclusive, it would be useful to examine other climatic proxies like the evidence from pollen and the faunal assemblage.

The result from the study of pollen in layer CRMA in the most recent excavations showed that arboreal pollen represented less than 10% of the recorded sample (Toussaint, *ibid*). Based on this information we could suggest the formation of this layer to a period when the climate was either as cold as the one recorded in Scladina, or perhaps a bit milder. In no case is there enough evidence to assign this layer to a significant climatic amelioration of the kind that we have tried to identify on the ice core climatic curves.

As far as the faunal assemblage from the Middle Palaeolithic layer is concerned, most of the information derives from the original Dupont excavations. During the most recent excavations in layer CRMA only two species were identified (bison and bear). On the contrary, in the original excavations of the Middle Palaeolithic layer a wide range of species, related to both open and closed environments were recognised (Rutot, 1909 and 1910). Unfortunately, due to the lack of any more recent report on the totality of the bone assemblage, we do not have access to the proportions of different species in the assemblage or any information related to the taphonomy of the bones. The only thing that we know for sure, in regard to the interaction of Neanderthals and animal bones in the cave, is the reported presence of burnt bones in the hearths, which might be related to the use of bones as fuel. The species identified by Rutot (*ibid*) included mammoth, rhinoceros, horse, reindeer, giant deer and bison, usually associated with open environments and red deer, roe deer and wild boar that are usually associated with more forested environments. Ibex, a species associated with cliffs was also identified. The carnivores present were cave bear, brown bear, spotted hyaena, cave lion, wolf and fox. Comparing this assemblage with the one from Scladina 1A, we could say that there are not many differences. In both cases we are dealing with a mixture of open and closed environments, where Neanderthals are using a cave site interchangeably with other big carnivores. One difference that might be of interest here is the absence of steppe ass from the Trou du Diable assemblage. Amongst the Belgian sites, dating to MIS 3, this species is only identified in Scladina (Stewart, *et al.*, 2003). Steppe ass, which is considered today an eastern steppic taxon is associated with open and dry environments and this might be another clue in favour of the idea that the conditions prevailing, when Trou du Diable was occupied were not as harsh as the ones recorded in Scladina, 1A.

In terms of the lithic artefacts collected from the Middle Palaeolithic layer of Trou du Diable, the information that will be presented follows Ulrix-Closset’s (1965 and 1975) study of the collections, curated at the Belgian Royal Institute of Science. The collections include 3,000 lithic artefacts. The artefacts are made on various raw materials, of which the most common is flint. The next most common is quartzite, while chert, quartz and sandstone are also used in smaller quantities. For the latter 4 materials there is good evidence pointing to the use of pebbles that would have occurred locally in secondary deposits. Although, it cannot be certain, such an association is also possible in the case of flint, given that many flint artefacts exhibit remnants of alluvial cortex on their surface.

The collection is composed mainly of debitage, while it also includes 70 cores and core fragments. Some of the quartzite and sandstone cobbles found in the assemblage bear traces of use as hammerstones, while others on softer stone with similar marks of use have been interpreted as retouchers. The cores occur in all different materials and are either discoidal or globular. There is some evidence in the debitage for the use of the Levallois and laminar techniques. The absence of Levallois or laminar cores in the assemblage though might mean that this kind of debitage was carried to the site from other locations. On the other hand, it is also possible that this debitage occurred in previous stages of reduction from the existing cores, before the latter took their finished form. The fact that for the great majority of the assemblage we get the different stages of reduction along with the presence of cores, hammer stones and retouchers points to a great extent to the performance of *in situ* knapping activities.

The tool count given by Ulrix-Closset for this assemblage is 330, but we should consider the actual number of retouched artefacts to be slightly smaller, given that Ulrix-Closset has included in the count naturally backed knives. Naturally backed knives, included in the retouched tools typology devised by Francois Bordes (1961a), are not actually retouched. Their definition as tools is based on the fact that a cutting edge exists opposite a back that is naturally fit for handling. Given that in this thesis all kinds of debitage are considered likely to have been used as cutting instruments, naturally backed knives are here included in the general category of debitage. The most common tool type, identified by Ulrix-Closset is the side scraper (at least 60%), and this category includes a variety of types that range from simple side scrapers to bifacial scrapers and scrapers with thinned back. Other types are Mousterian points (50 specimens), many of them broken and backed knives. Finally, there is a partial handaxe in the assemblage that retains large quantities of cortex on its surface and seems to have been made on a flint cobble.

Now, if we try to interpret the Middle Palaeolithic occupation of Trou du Diable in the context of the explanatory scheme proposed in chapter 2 of this thesis, the following observations can be made. The fact that Trou du Diable is a sheltered site, where fire was used points to its possible association with the *food consumption/resources processing* sites. These were the sites, where we assume that Neanderthals would have found shelter after a hunt and where they would have stored and consumed meat. The use of fire at these sites would have been imperative, due to the fact that Neanderthals would have spent longer periods there and they would need to keep other large carnivores away. This association would be better tested if we could have a re-evaluation of the faunal assemblage of this site with modern methods. A taphonomic examination of the assemblage might show if there is evidence of interaction between Neanderthals and the animals that are found at the site. For the time being the evidence from the lithic assemblage seems to support such an association. The predominance of debitage, which includes naturally backed knives and the presence of backed knives could have well been associated with some type of light-duty butchery or filleting that we would expect to occur in this type of site. In such a context the predominance of scrapers in the lithic component could be associated with hide or wood processing which would be at least some of the activities undertaken in the period that the group spent there. It is possible that the handaxe was manufactured for assisting in this type of activity as well, although the artefact not being finished, we cannot rule out the possibility that its main use was as a core that produced flakes.

One of the most interesting aspects of this lithic assemblage is a relatively high number of Mousterian points. It is possible that the systematic manufacture of this type of armature at the site could have occurred as preparation of future hunting expeditions. Trou du Diable, apart from being a naturally protected site would have also offered the opportunity to observe animal movements in the surrounding area. This could probably indicate a merging of two types of sites: the *food consumption/resources processing* and the *rest/recreation/observation* sites, something that was thought possible also in the case of Hyaena Den in the previous chapter. On the other hand, if we take into consideration that so many Mousterian points are found at Trou du Diable and they have not been transported to hunting sites, this might call for an alternative explanation.

It is possible that these points were made to be hafted on spears that were used at the site, as Neanderthals would have to protect their habitation from other large carnivores. The co-presence of Neanderthals and other carnivores in cave sites during MIS 3 is quite common and could be interpreted as an interchange of occupations. In cases like the one of Scladina-1A, Neanderthal visits might have only lasted a few hours each time and this would have possibly reduced the risk of confrontation with other occasional habitants of the cave. In the case though of Trou du Diable, where the occupation would have possibly lasted for days, confrontation might have been unavoidable. In this context the broken Mousterian points could be interpreted as the result of such confrontations. Further exploration of this possibility could be pursued through organic residue studies on the artefacts that could hopefully show if they have actually been used on animals and which species.

Finally, in terms of assigning the occupation of Trou du Diable to a specific climatic episode, we saw that it possibly relates to a cold period, although this does not seem to be as cold as the one identified in Scladina-1A. The interpretation for this may be that this occupation happened in a period of climatic cooling but before the conditions reached extreme levels. In this sense, the occupation of Trou du Diable can also count as evidence that Belgium retained Neanderthal populations in cooler periods, in this case more likely referring to the periods of initial climatic cooling.

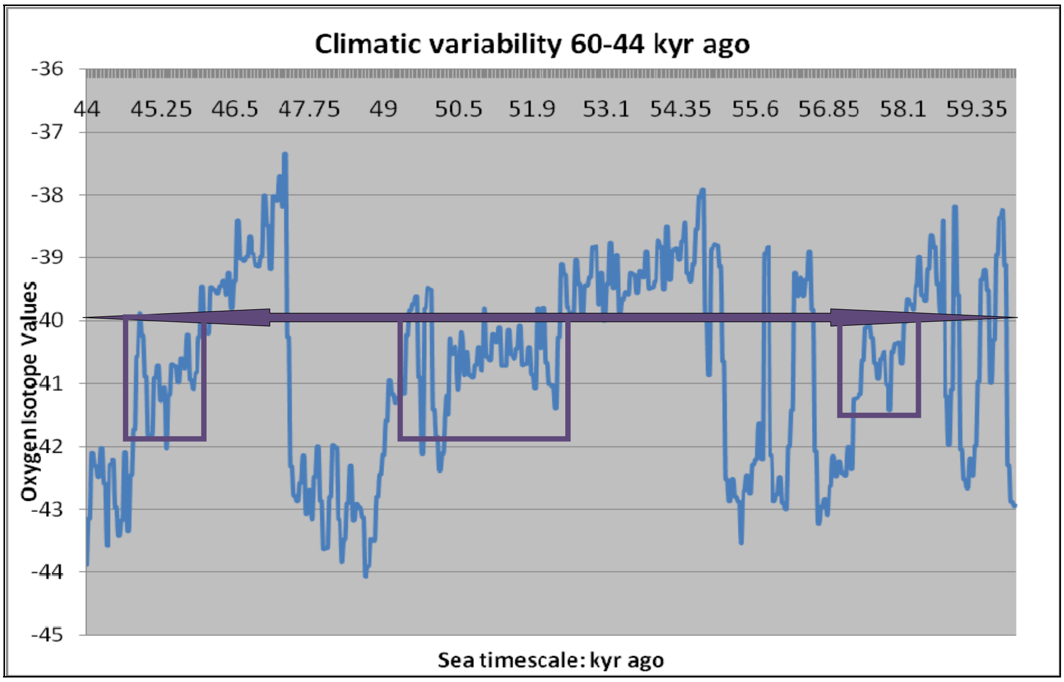


Figure 50: Climatic variability in the period between 60 and 44 kyr ago. The initial parts of climatic deteriorations are marked. Data from NGRIP, available at: http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Figure 50 is a graph showing the climatic variability in the period between 60 and 44 kyr ago, to which the Neanderthal occupation of Trou du Diable dates. The purple arrow indicates the cut-off point used in this thesis for the definition of climatic ameliorations. The occupation at Trou du Diable could have occurred at the points in time when oxygen isotope values go below this limit and more likely in the beginning of these climatic deteriorations before the isotope values reached their lowest levels. This would require, in my view, a relatively long period, during which the oxygen isotope values would fluctuate without reaching their lowest possible level. There are three such periods, during which this pattern occurs, in the specific time frame; one of these is the beginning of the deterioration that is possibly related with the occupation of Scladina as proposed in the previous section. It is impossible to tell with which of these periods the Trou du Diable actually correlates. One way to shed further light on this would be to re-date bones from this assemblage with new methods for removal of contamination as in the method of ultra-filtration applied by the Oxford lab. For the possibility to apply C^{14} on charcoal remains or TL on burnt flints and/or sediments, the site would have to be re-visited with a new excavation specifically designed to re-locate, if possible, remnants of the sediments that contained the Mousterian hearth. In any case even if Trou du Diable was proved to date from the same episode of climatic deterioration as Scladina-1A, it would not probably date from the same part of this episode, which makes any correlation of the two occupations in a synchronic level largely impossible. In the next section I will discuss the evidence for the occupation of Belgium, during climatic ameliorations.

4.4. Veldwezelt-Hezerwater

Veldwezelt-Hezerwater is located in Lanaken in the province of Limburg. It was identified in the now dry valley of the Hezerwater stream, a tributary of the Meuse, about 1 km south-east of the town of Veldwezelt. The loamy fill of the left bank of the Hezerwater valley was exploited between 1995 and 2002 by the N.V Vandersanden Company. In 1996 Middle Palaeolithic artefacts were discovered in the Vandersanden Quarry and the archaeological exploration of the site began (Vanmontfort et al., 1998). This was a collaborative project that brought together the Catholic University of Leuven, the Gallo-Roman Museum of Tongeren and the Institute for the Archaeological Heritage of the Flemish Community (Bringmans, 2001). The archaeological excavations lasted until 2003, when the preliminary excavation report was published (Bringmans et al., 2003). A more detailed study of the site and its finds was conducted in the course of a PhD thesis (Bringmans, 2006a) and an outline of the results has been published (Bringmans, 2006b).

The sequence uncovered in Veldwezelt-Hezerwater was composed of loess sediments, which accumulated during cold periods. These were intermittently interrupted by the formation of soils, when more favourable climatic conditions prevailed. The sequence spans the period from MIS 6 to the middle of MIS 3 (c. 230 kyr-35 kyr ago). The archaeology occurs mainly in these soil horizons, while in the base of the sequence, dating to MIS 6, some archaeology is found in secondary position in gravels. The sequence contains two soil horizons that have been associated with MIS 3. These are the TLB horizon, which contains three distinct open air loci with archaeological finds and the WFL horizon, which contains one such locus. Both the TLB and WFL horizons date in early MIS 3 (c. 60-50 kyr ago), according to the chronostratigraphical studies of the sequence.

More specifically, the TLB horizon dates to the beginning of MIS 3, (c.60 kyr ago), while WFL dates to a later stage (c. 50 kyr ago). The occupations in the 4 distinct loci of the two horizons (TLB and WFL) will be discussed in detail below.

4.4.1. The TLB horizon occupations.

The sedimentological study of the TLB horizon indicates a low energy environment, where there was a mixing of slope and valley sediments. The formation of the TLB soil was weak, which is consistent with its formation, during an interstadial, rather than an interglacial. The factor of synsedimentary pedogenesis was identified in this soil, which means that some of the soils already formed were at times covered by new soil formations occurring at the same place (Bringmans, 2006a). This indicates the possibility that the artefacts found in this soil were the result of a palimpsest of activities occurring through time. Another factor identified in the formation of this horizon was the burrowing of animals, which could have possibly resulted in further mixing of the assemblages. The part of the soil that contained the artefacts was in a transition from a young to mature phase, indicating that the climatic amelioration was well underway when the occupations occurred. All the occupations of this horizon occurred on the left bank of the meandering valley of the Hezerwater stream.

The TLB horizon contains occupations in three areas named TL-R, TL-GF and TL-W respectively. These areas that are situated about 20 metres from each other were excavated systematically but not on the total of their surface, and hence the material uncovered can only be treated as a sample. The lithic assemblages from these horizons are stored at the Prehistoric department of the Catholic University of Leuven. The description of the assemblages that follows is based on my own observations.

The TLR occupation is represented by a small lithic assemblage. No bones were associated with this assemblage. The lithic assemblage consists of 40 artefacts. These are in various stages of wear (Figure 51), which possibly indicates that the assemblage is a palimpsest.

The only raw material used in this assemblage is flint that can be divided in at least two types. The most common type is flint of grey or black colour that occurs in primary position in the area of Lanaye, only 5 km away from the site. The other is translucent flint of which only two pieces have been identified and is of unknown origin. There are also 14 artefacts for which the type of flint could not be identified due to patination and they could belong to any of the two materials or even another type of flint.

For the two types of flint that have been identified we know that in both cases the main procurement strategy was related to the use of material in the form of pebbles, possibly from the Meuse river beds, not more than 3.5 km away. This is based on the presence of alluvial cortex in artefacts of both materials. In the case of Lanaye flint the presence of worn chalky cortex on one piece may indicate that at times Neanderthals collected this material from outcrops at the area of its origins (5 km away).

Most of the artefacts in the assemblage do not retain any cortex on their dorsal (Figure 52) and this could indicate that the initial stages of reduction took place elsewhere, either at the source of these materials or on the way from the source to the TL-R locus. This idea will be tested further on the basis of the types of artefacts occurring in the assemblage.

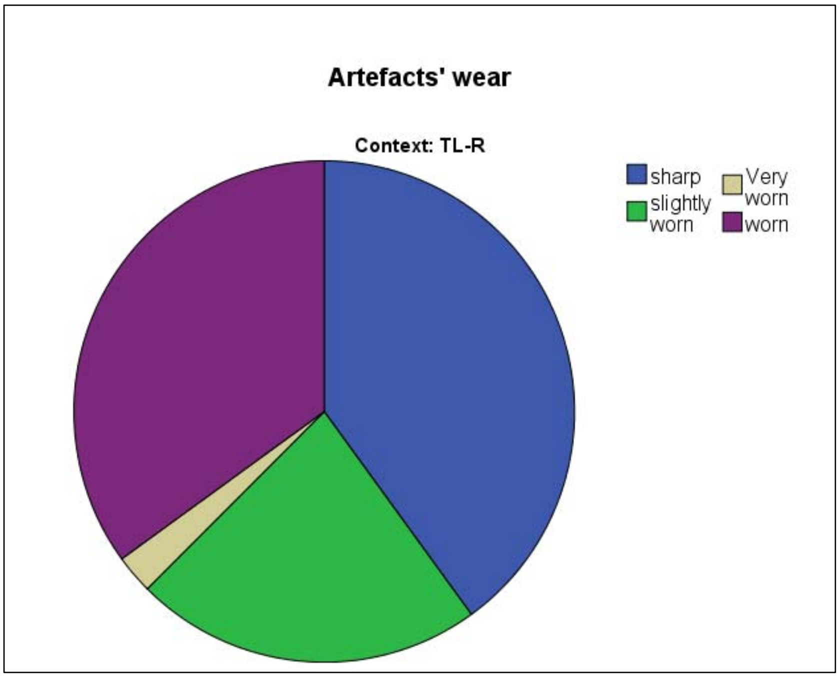


Figure 51: Condition of the lithic artefacts in the TL-R context (Pers. Obs.)

The assemblage consists of 35 pieces of debitage and 5 scrapers (Table 16). In the debitage category there are indications for the use of Levallois technique and also for the reduction of handaxes and the sharpening of scrapers. There are no cores in this assemblage. The two artefacts on translucent flint are two pieces of debitage, one resulting from the removal of a core edge, while the other one is a flaked flake. It is interesting that of the total of 35 pieces of debitage, 15 are chips and debris (smaller than 2 cm).

In general the view we get from this assemblage is that Neanderthals carried cores which they reduced at the site, performing *in situ* knapping but they did not leave these cores there. They possibly took them with them as they moved on, in order to use them again. The same seems to have happened with the handaxes, for which there is evidence that they were present at the site at some point in time, but they were not abandoned there. The evidence for the re-sharpening of scrapers and the 5 scrapers found at the site are possibly related to the use of these tools there. The scrapers would have been used, re-sharpened on the spot and possibly re-used again before some of them were abandoned at the site. Whether these tools were carried to the site in a finished form, or manufactured *in situ* is not easy to tell. None of the two scenarios can be ruled out. In any case what we cannot ignore is the transitory character of this assemblage. It seems that Neanderthals stopped for very short periods of time at the locality. They performed some knapping and used some of their tools at the site, re-sharpening them, when it was necessary. After that they moved on, taking with them whatever could be re-used elsewhere.

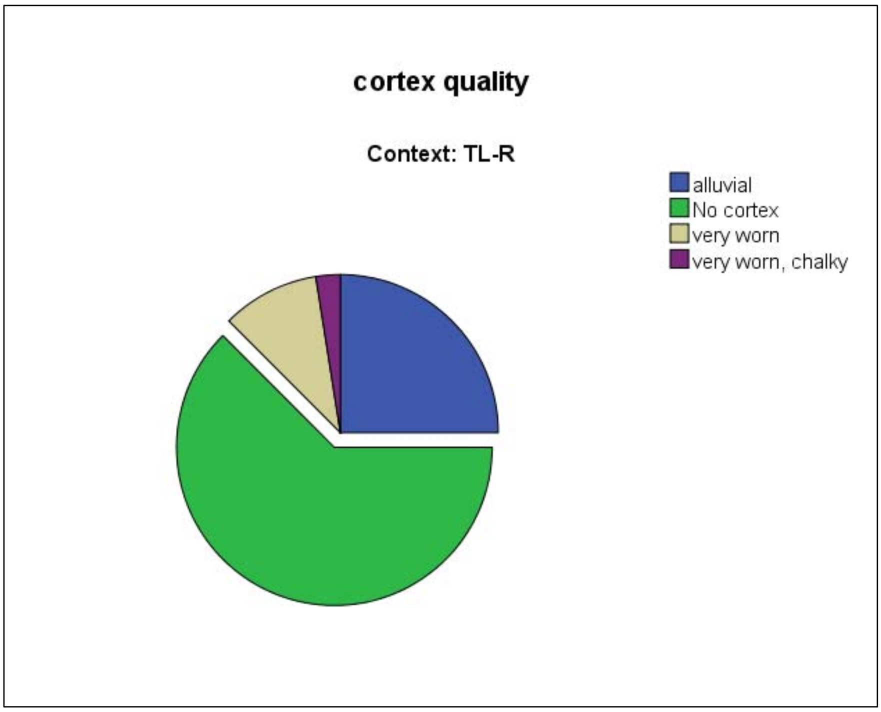


Figure 52: Type of cortex recorded in the TL-R artefacts (pers. obs.)

Type of artifact	**Frequency**
Debitage	30
Debitage from handaxe manufacture/ maintenance	2
Debitage from retouched tool curation	2
Levallois debitage	1
Scraper	5
Total	40

Table 16: Frequencies of artefacts' types in the TL-R context (Pers. Obs.)

In terms of the site typology used in this thesis what we can say about the TL-R locus is the following. The size of the assemblage could only be associated with the rest/recreation/observation sites. Although not at a location with a commanding view, the site being near a water source would have been an ideal place for the group to rest for a while. At the same time they would have observed the movements of animals that would approach the area to drink water. The group would have performed the communal activity of knapping but would have also processed other resources, possibly hides or wood using their scrapers, hence bonding in anticipation of a possible coming hunt. It is also possible that the handaxes they were carrying with them were to be used elsewhere, possibly at a meat acquisition site. Given the proximity of the sources from which the lithic assemblage derived, it is possible that in this case we are dealing with real snapshots of a Neanderthal group on the move, in the course of their daily hunting range. In this sense it would be interesting to survey the area in this small 5 km range for the possibility to identify sites of the other two categories, namely the meat acquisition sites and the meat consumption/resources processing sites.

The TL-GF locus is situated 14 m south of the TL-R locus. No bones were associated with this occupation either. The lithic assemblage consists of 24 artefacts. All of them are made on flint. Nine could be associated with the Lanaye flint, occurring in grey and black colour. The rest could not be identified to a specific type, due to patination. Again the condition of the artefacts points to a palimpsest, given that they are in different stages of wear (Figure 53). As in the case of the TL-R assemblage most of the artefacts do not retain any cortex on their surface. In the ones that do preserve some cortex, this is of alluvial nature, pointing again to the use of pebbles as the primary source for this material (Figure 54).

The assemblage is composed mainly of debitage (Table 17), while there is also a core fragment and two scrapers, one of them broken. There is evidence that both the discoidal and the Levallois techniques were used in this assemblage. Again, like in the case of the TL-R assemblage, there are indications that handaxes were reduced at the site and scrapers re-sharpened. Finally, there are a few chips and debris and a broken flaked flake. The view we get from this assemblage is very similar to the one described for TL-R above.

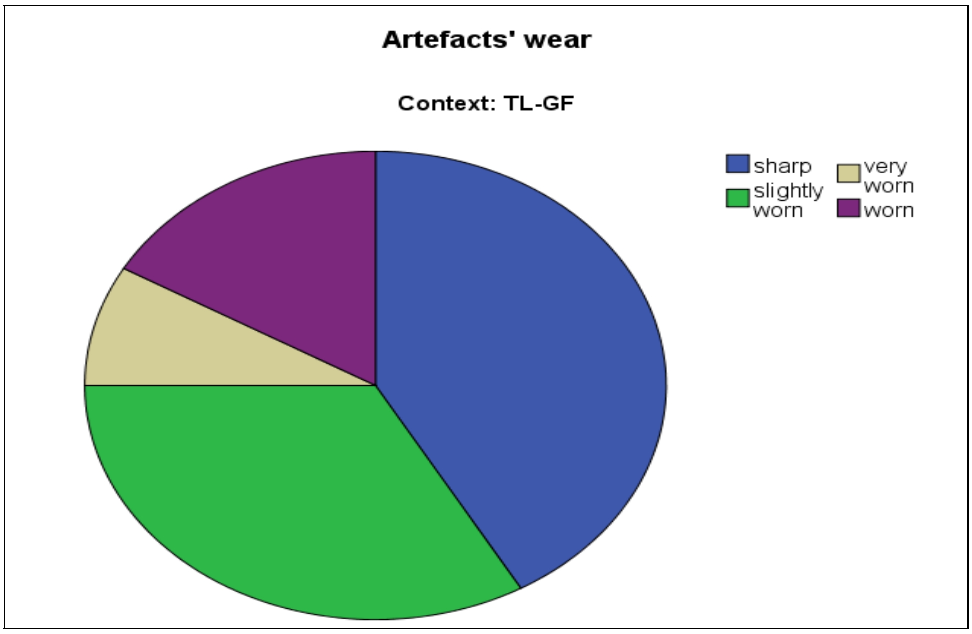


Figure 53: Condition of artefacts in the TL-GF context (pers. Obs.)

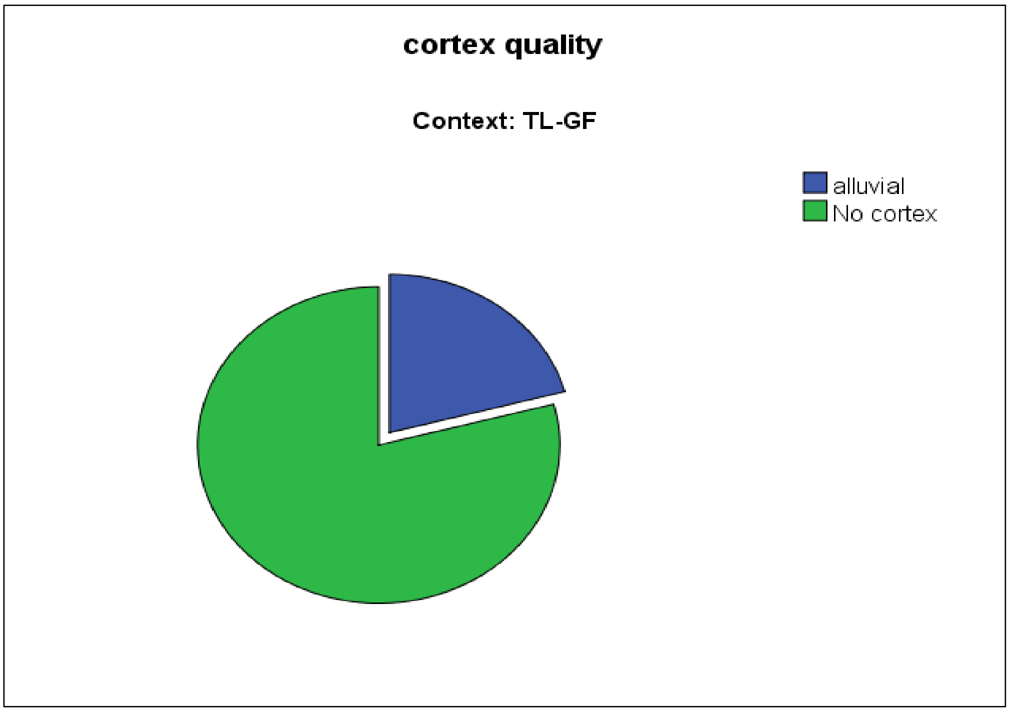


Figure 54: Type of cortex recorded on artefacts from the TL-GF context (Pers. Obs.)

The absence or near absence of cores, the *in situ* knapping, the *in situ* use and re-sharpening of tools, the preparation of handaxes that are transported elsewhere are common in both assemblages. Given that these two occupations occur at the same location in the same environmental conditions and possibly really close in time, this is of no big surprise. As in the case of TL-R, the TL-GF locus can be possibly characterised as a rest/recreation/observation site.

Type of artefact (TL-GF)	**Frequency**
Core fragment	1
Debitage	11
Debitage from handaxe manufacture/maintenance	3
Debitage from retouched tool curation	2
Discoidal debitage	4
Levallois debitage	1
Scraper	1
Scraper fragment	1
Total	**24**

Table 17: Types of artefacts recorded in TL-GF (Pers. Obs.)

Finally, the TL-W locus is situated 27 metres south of the TL-GF locus. No bones were associated with the occupation of this locus. The lithic assemblage consists of 34 artefacts. They are in various stages of wear, ranging from sharp to much worn. This evidence points once more to a palimpsest. Some of the artefacts exhibit post-depositional edge damage, in the form of irregularly broken edges, which could be related to the trampling of sediments by animals or humans (Mcbrearty et al., 1998). One of them exhibits signs of cryoturbation, in the form of irregular alternate retouch (Debenath and Dibble, 1994).

All the artefacts are made on flint. 26 are made on the Lanaye flint of black colour, 1 is made on translucent flint, while the rest could not be associated to a specific type of flint due to the heavy patination of their surface. Most of the artefacts do not retain any cortex on their surface (Figure 55). In the cases that cortex exists it is mostly alluvial, pointing to the use of pebbles as the main source of raw material.

In terms of the types of artefacts found in the assemblage, the following observations have been made (Table 18). The assemblage consists mainly of debitage, while it also includes four scrapers and the fragment of a Levallois point. There are indications for the use of both the Levallois and the discoidal techniques, while the category of debitage also includes two flaked flakes. Similarly to the previous two assemblages there are no cores in the TL-W lithics. Unlike them though, in TL-W there is no evidence for the re-sharpening of tools or the maintenance of bifaces.

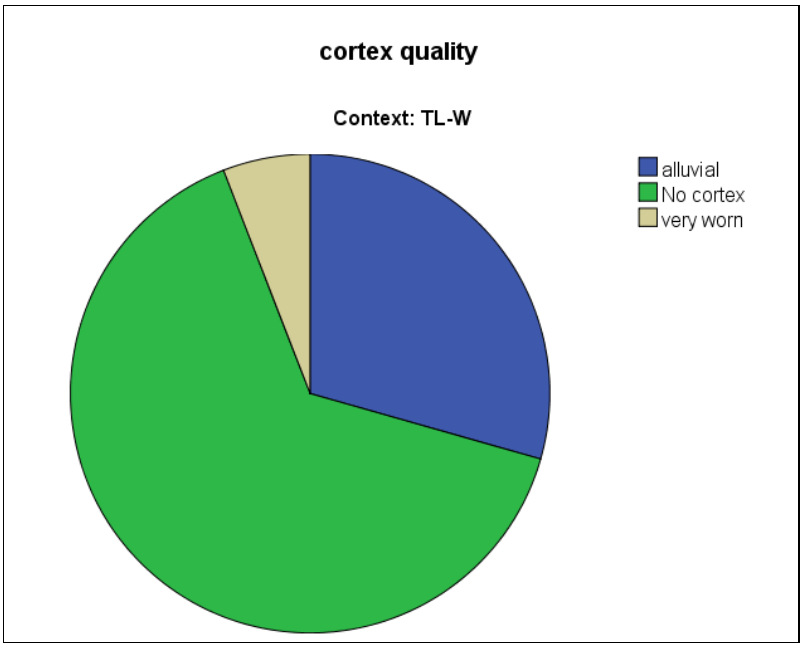


Figure 55: Type of cortex recorded on the artefacts from TL-GF (Pers. Obs.)

Type of artefact	Frequency
Debitage	20
Discoidal debitage	3
Levallois debitage	6
Levallois point fragment	1
Scraper	4
Total	34

Table 18: Types of artefacts recorded in the TL-W context (pers. Obs.)

These three assemblages are in many aspects very similar, due to the following activities taking place: transport of cores, in *situ* knapping activities, use of retouched tools at the site, transport of the reduced cores to other locations. There are also differences, in the sense that in the TL-W locus there is a reduced amount of further planning, as indicated by the absence of debitage from handaxes. On the other hand, the lack of evidence for tool re-sharpening may indicate that this locus represents a type of occupation that was even shorter than the ones seen in the other two loci. The shorter period of occupation could be the reason why there was no need to re-sharpen tools and possibly no time to prepare handaxes, although these two aspects could also be the result of a more careful use of resources by the Neanderthal group. Of course, we cannot rule out the possibility the handaxes were not reduced at the site because they were not used there and they did not need re-sharpening, or alternatively that the group that stopped there did not carry handaxes at all. Finally, it would be interesting in this context to consider the presence of the broken Levallois point. It is possible that this artefact was broken in use and hence the possibility of confrontation with other big carnivores at the site cannot be ruled out. Alternatively, it could be interpreted as a hunting attempt that did not go so well, as shown by the complete lack of butchery evidence. In both cases, it would seem reasonable that Neanderthals would quickly move on from this site, either for protection or to search for other prey.

In terms of assigning this occupation to a specific type in the typology used in this thesis, we could say that there is no obvious reason why it would be different from the other two loci. The only possible difference is that this occupation might have been even shorter.

Now in terms of assigning the occupation of the three loci of the TLB horizon to a specific climatic episode within MIS 3 the following can be said. The excavators have placed the formation of this soil in the beginning of MIS 3, and we know that it represents a climatic amelioration. Figure 56 is a graph showing the climatic variability between 60 and 55 kyr ago.

At the beginning of MIS 3, there are four climatic ameliorations, according to the explanatory model proposed in chapter 2 of this thesis. These were also examined in detail in chapter 3, when we tried to assign the Lynford occupation to a specific mild episode. As in the case of Lynford, the episode between 59 and 58 kyr ago seems to be the likeliest candidate. It is almost as warm as the other three episodes and it has the longest duration. It is considered here that this episode of amelioration would be likelier to result in the formation of a soil. The fluctuation of the climatic curve is also consistent with the evidence for subsequent depositions of soil evidenced in the TLB horizon.

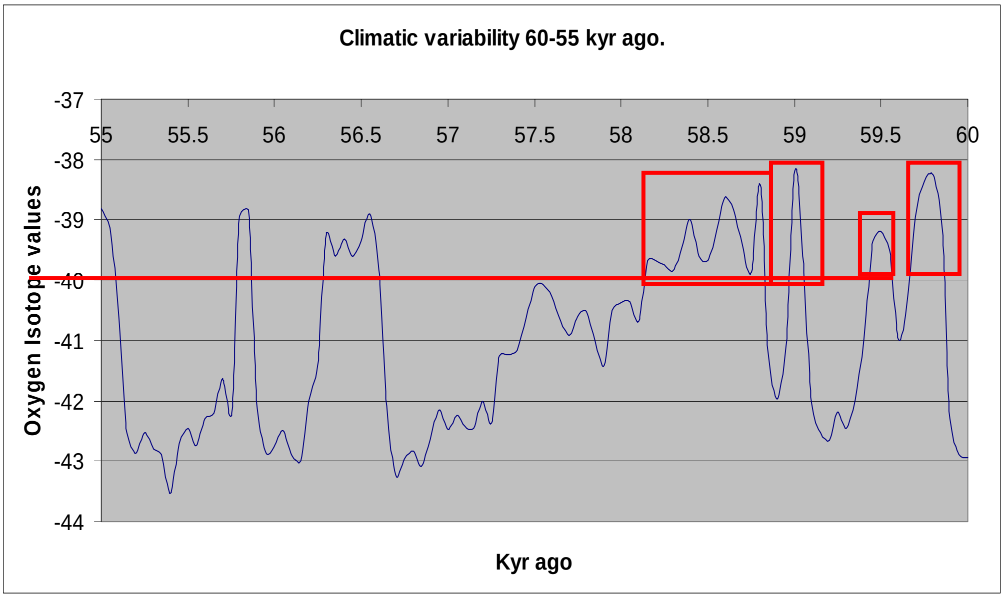


Figure 56: Climatic variability between and 60-55 kyr ago. Climatic ameliorations are marked. Data from NGRIP, available at: http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

4.4.2. The WFL horizon occupation.

The WFL horizon was formed as a result of the mixing of slope and valley sediments and it indicates a low energy environment. The pedogenesis in this soil was weak, indicating formation during an interstadial rather than an interglacial. Still, it was stronger than in the TLB horizon, which may mean that this soil formed during a warmer climatic amelioration. As in the case of the TLB horizon there is evidence for synsedimentary pedogenesis, meaning that multiple soils formed on top of each other. This might be an indication that the lithic assemblage of the WFL locus is also a palimpsest but this will be further tested in relation to the taphonomy of the assemblage. The occupation of the WFL locus occurred on the left bank of a Hezerwater meander.

The WFL horizon has been dated by the excavators of the site to c.50 kyr ago on chronostratigraphical grounds (Bringmans, 2006b). An absolute date was also obtained from this horizon. It was a C^{14} AMS date on a bone processed by the Groeningen Lab. The result was 45,440+4450/-2850. The date cannot be calibrated with CalPal, because of the discrepancy in the values of the standard deviation. In this sense, the mean of this date can be only used as a *terminus ante quem*. Based on this date, the occupation in WFL could date anywhere in the period between 60,000 and 45,000 calibrated years ago.

The WFL horizon contained lithics and a faunal assemblage. This was composed of 225 specimens, including bones and teeth, according to Cordy's study (Bringmans, 2006a). The composition of the assemblage indicates an open environment, since there are no species that are usually associated with forests. The most common species in the assemblage was the horse (39.5%), followed by the woolly rhino (24.4%). The next most common species was steppe bison (15.5%), while mammoth (7.5%), reindeer (0.8%) and steppe ass (0.4%) followed in smaller numbers. The assemblage also included a range of carnivores. These were the spotted hyaena (4.8%), polar fox (4%), badger (1.3%) and cave lion (0.4%). Finally, there were two specimens of hare (0.8%). The bones have undergone considerable alteration in the soil and according to Cordy (*ibid*), this could be masking the evidence for possible interaction between Neanderthals and these animals. On the contrary, there is good evidence for the presence of a hyaena den in the area. These are the presence of partially digested bones, the remains of hyaena coprolite and the fact that the hyaena remains all come from young individuals. Nearly all the bones in this assemblage show evidence of gnawing from hyaenas or digestion traces. It is likely that the hyaenas' processing of the bones could have overprinted any human activities, which now are impossible to determine.

The lithic assemblage from the WFL locus is stored in the Catholic University of Leuven. The description of the assemblage that follows is based on my own observations. The assemblage consists of 125 artefacts. They are in various stages of wear (Figure 57), possibly indicating a palimpsest. They are made on flint, except from one made on chert. The type of flint used is mainly (85 artefacts) the Lanaye of grey and black colours that occurs in primary position in an area 5 km away from the site. There are also two artefacts on translucent flint. For 37 artefacts it was impossible to identify the type of flint used, due to the heavy patination of their surface.

Most of the artefacts in the assemblage do not retain any cortex on their surface making it likely that the initial stages of reduction happened elsewhere. The ones that do retain cortex usually have the alluvial type (Figure 58), indicating the use of pebbles as the main source for raw materials. This could have happened either at the river bed of the Meuse or at an old terrace of the same river, which is not further than 3.5 km away from the site. The two artefacts on translucent flint and the one on chert do not retain any cortex on their surface and hence their provenance cannot be easily hypothesised.

The assemblage consists mainly of debitage (94.8 %), as shown in table 19. This includes evidence for the use of Levallois, discoidal and laminar techniques, as well as flakes from the preparation of handaxes. It also includes two flaked flakes. There are 6 cores in the assemblage, one being a core on flake and three being Levallois. In terms of tools there are only a denticulate, a scraper, and a broken Levallois point.

Looking at this assemblage as a whole, we could say that Neanderthals reached this site carrying pebble cores from a few kilometres away but most of these had already been reduced elsewhere. They spent enough time at the site to exhaust some of these cores, which they left behind. Their main activity at this site was the production of debitage, while the use of tools was very limited. It is possible that apart from the two retouched tools found in the assemblage, they also used some handaxes, which they re-sharpened and carried away with them, when they left. Once again the presence of a broken Levallois point could be related either with a hunting attempt or with a possible confrontation with other big carnivores. Such big carnivores were roaming the area as shown by the faunal assemblage, which contained bones of spotted hyaena and cave lion.

More specifically, the presence of a hyaena den at the area would have very possibly caused confrontations if Neanderthals and hyaenas happened to occupy this area at the same time. The hyaenas would have been really aggressive in their attempt to protect their young ones. In relation to the bone assemblage at the site it was mentioned before that it is not possible to estimate if and to which degree Neanderthals played any role in its accumulation. It is possible though that some kind of competition could have occurred at the site for this meat resource. Whether Neanderthals hunted and hyaenas scavenged, or the opposite, or even whether they constantly contested each other for the acquisition of meat, remains unknown.

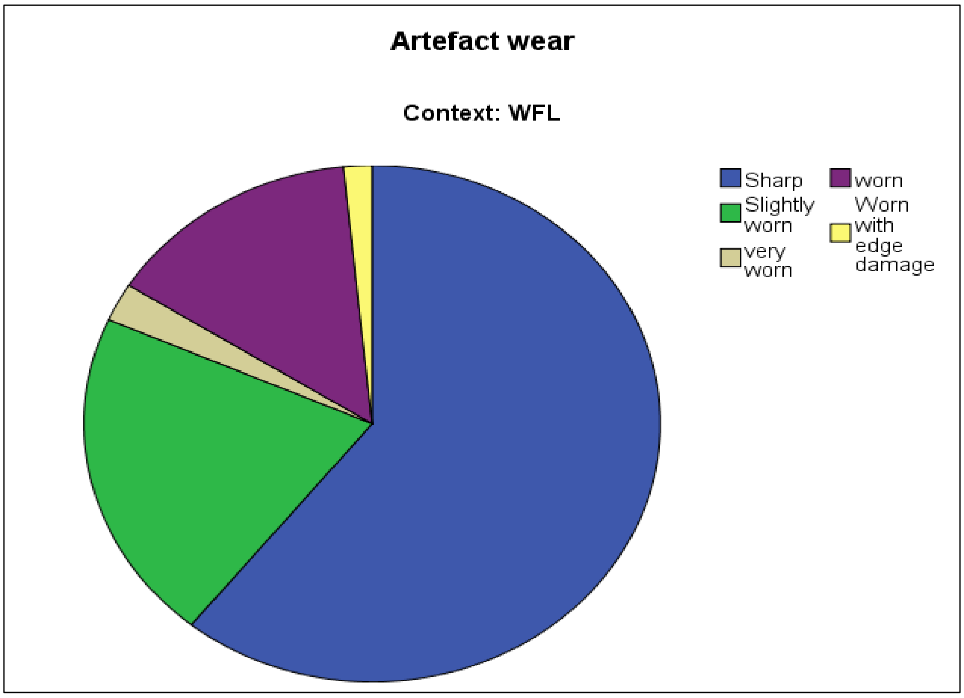


Figure 57: Condition of artefacts in the WFL context (Pers. Obs.)

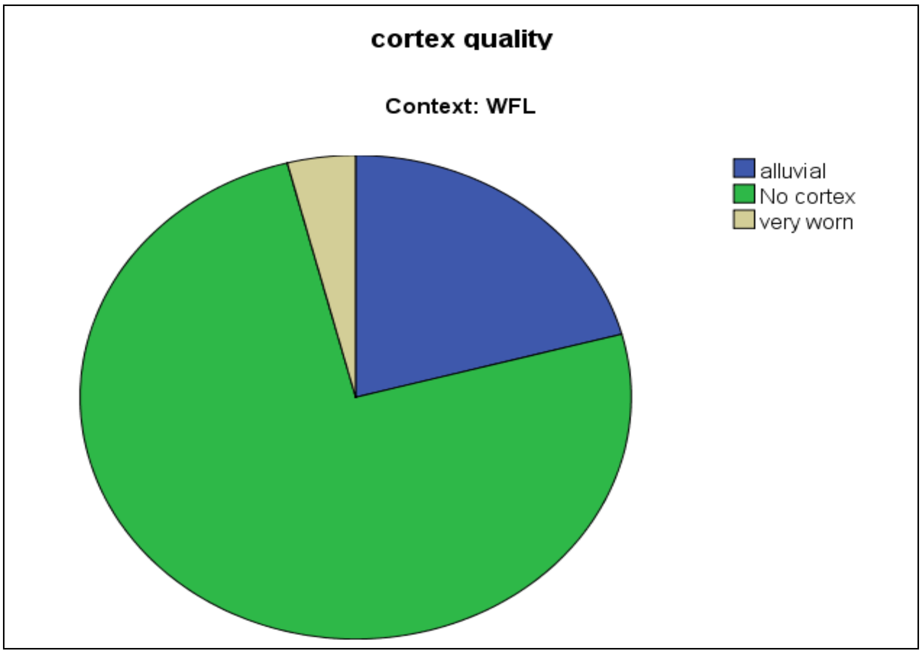


Figure 58: Type of cortex recorded on the WFL artefacts (Pers. Obs.)

Type of artefact	Frequency	Percent
Amorphous core	2	1.6
Core on flake	1	0.8
Debitage	98	78.4
Debitage from handaxe manufacture/mainte nance	5	4.0
Denticulate	1	0.8
Discoidal debitage	10	8.0
Laminar debitage	1	0.8
Levallois core	3	2.4
Levallois debitage	2	1.6
Levallois point fragment	1	0.8
Scraper	1	0.8
Total	125	100.0

Table 19: Types of artefacts recorded in the WFL context Pers. Obs.)

Although there is no direct evidence for butchery at this site, we cannot completely rule out the possibility that Neanderthals acquired meat there. It becomes obvious once more through this assertion that the limits of the typology proposed in this thesis are not as rigid as scientific enquiry would normally demand. It also becomes apparent that rest/recreation/observation sites, when they occur near water sources, like in the case of the 3 loci in the TLB horizon are places of opportunity. They are potentially meat acquisition sites, but this always depends on the presence of other animals, herbivores and carnivores, at the same place and at the same time. This type of Neanderthal site has already been described in chapter 3, in the case of the occupation of Lynford, where Neanderthals and hyaenas seemed to take turns hunting and scavenging different animals. The difference is that in Lynford, there are at least the minimum indications that Neanderthals participated in the formation of the bone assemblage. Given the uncertainty of the outcome of the interactions that would have taken place between Neanderthals, other carnivores and herbivores near this water source, I propose the application of a new type to describe occupations like WFL. The term I will use will be *predation sites*.

In terms of assigning the occupation of the WFL locus to a specific climatic episode, the following can be said. As we mentioned above this occupation seems to date to a mild climatic episode in the period between 60 and 44 kyr ago. Figure 59 is a graph showing the climatic variability in that period. There are three major warming episodes, one in the period between c. 59 and 58 kyr ago, one between c. 54.5 and 52.4 kyr ago and one in the period between c.47.5 and 46 kyr ago. Although the second episode is the longest in duration, the third is the warmest. As mentioned above, the formation of the soil in the WFL horizon happened with greater intensity than the formation of the soil in the TLB horizon. In this sense it might be possible, if we compare these two warming episodes with the one that we assigned to the TLB horizon to decide which is more likely to have been responsible for the formation of the WFL horizon. This could be the one that would clearly show more intensity than the one that we considered responsible for the formation of TLB.

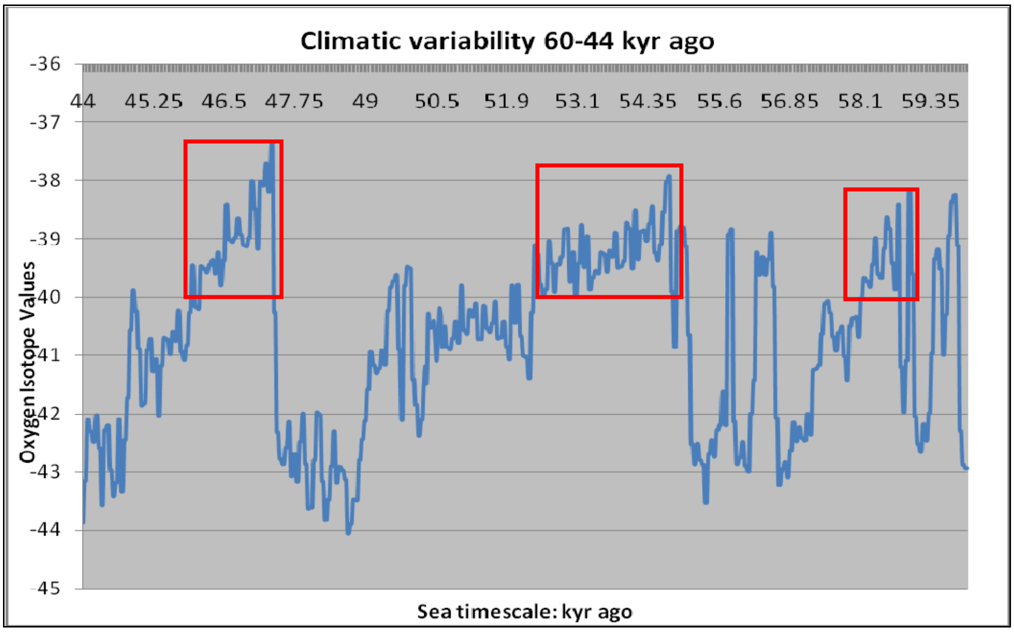


Figure 59: Climatic variability between 60 and 44 kyr ago. Climatic ameliorations are marked. Data from NGRIP, available at: http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Figure 60 is a graph showing the climatic variability in the period between 60 and 44 kyr ago. The likely episode for the formation of TLB is noted, as well as the two candidate episodes for the formation of WFL. Both the latter episodes seem warmer than the supposed TLB episode, and in this sense no conclusion on the subject can be reached.

On a final remark to this subject, we should note the possibility that from the four sites presented in this chapter (Scladina-1A, Trou du Diable, WFL, and TLB), the first three could be correlated with the same sequence of climatic events, related to the warming of c.47 kyr ago and the subsequent cooling. Of course none of these sites can be correlated with this period with any certainty and any such correlation is strictly speculative. For it to be proven it would require more precise absolute dates for all different occupations. In the case of the relative chronological positions of Scladina-1A and the WFL or even the TLB loci, it would be interesting to compare the Weldwezelt horizons with a re-worked soil, originally deposited outside Scladina and found in layer 1B. This layer underlies layer 1A and is believed to date to MIS 3 as well (Pirson *et al.*, 2008).

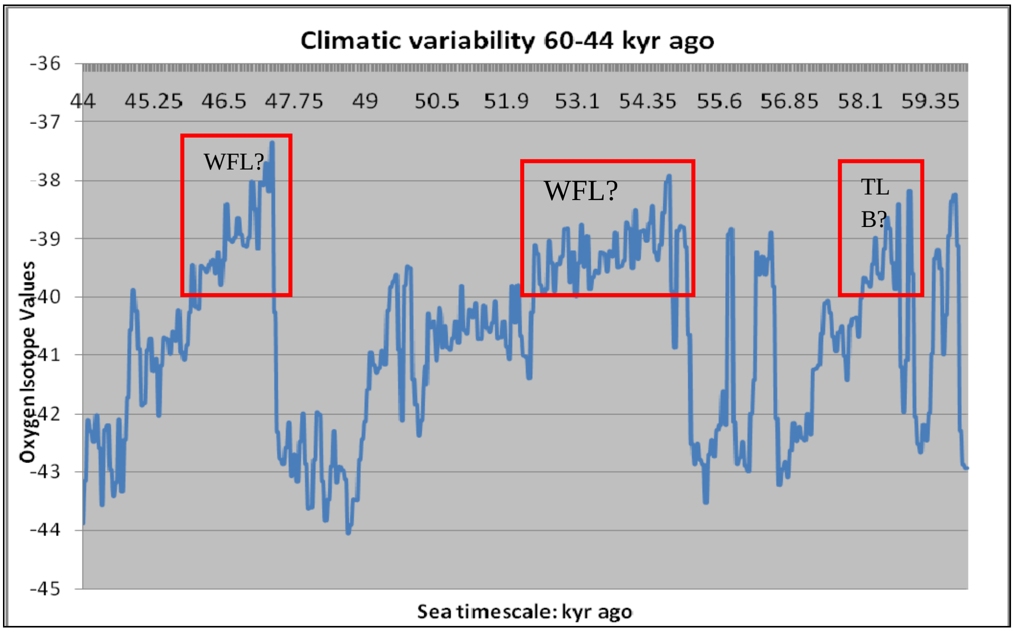


Figure 60: Climatic variability between 60-44 kyr ago. Climatic ameliorations that could be associated with the sites presented in this chapter are marked. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

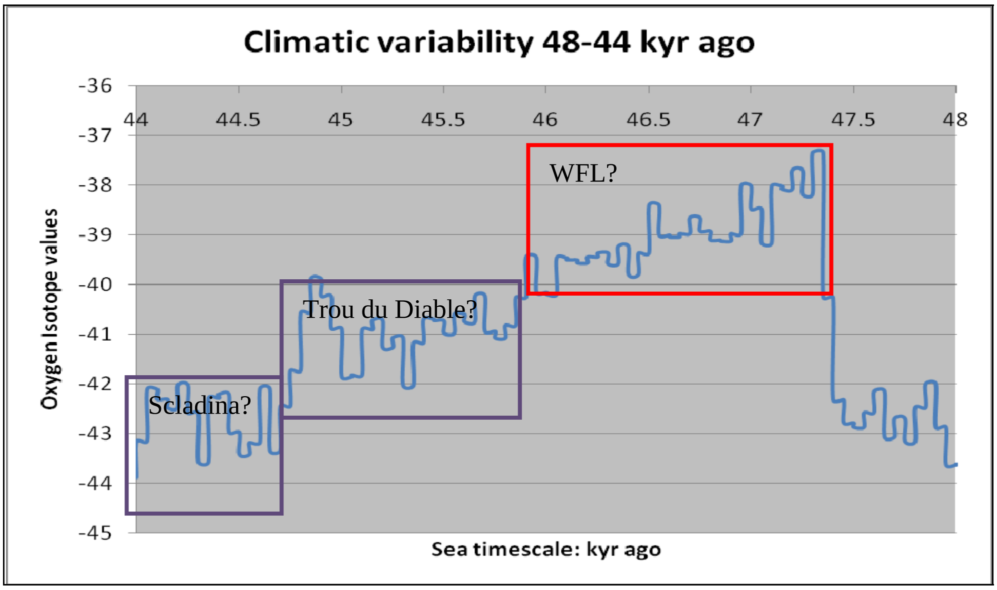


Figure 61: Climatic variablity between 48 and 44 kyr ago. The hypothesis of occupations in consecutive climatic episodes is highlighted. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

Just for the sake of the argument I will present here the sequence of events deriving from a possible chronological association of Scladina-1A, Trou du Diable and WFL. Figure 61 is a graph showing the climatic variability in the period between 48 and 44 kyr ago. The view deriving from a possible consecutive occupation of these sites is presented. In such a case, the three sites would have been occupied in consecutive climatic episodes, starting with a climatic amelioration, followed by a period of initial deterioration and finally reaching the coldest conditions. This hypothesis can neither be proved nor negated at this stage and its main purpose here is to show more clearly how Belgium could have been populated by Neanderthals in various and consecutive climatic events.

4.3. A summary and discussion of the sites and their interpretation.

In this chapter we examined 4 distinct Middle Palaeolithic occupations (one of which consisted of three different loci) in three different sites in Belgium. In the climatic model outlined in chapter 2 of this thesis, a hypothesis was put forward that it would be possible for Neanderthals to occupy Belgium, not only during the milder periods, as it was proposed for Britain but also during the periods of initial climatic cooling.

The examination of the data in this chapter and more specifically of the case of Scladina 1A showed that at least some Neanderthals were likely to have remained in this area of Western Europe, even during the coldest periods of MIS 3. Of course we have no idea how successful these occupations might have been in terms of survival of the group or even how often this happened. It would be interesting, when more Belgian sites are associated with certainty to MIS 3, to further investigate in what climatic episodes these occupations occurred.

The fact that Neanderthals seem to have remained in Belgium, during periods of very harsh conditions may have not been necessarily by choice. The fact though that they survived long enough to leave archaeological traces of these occupations should be definitely related to the refugial character of this area. The characteristics of refugia described by Stewart and Lister (2001) seem to have definitely characterised the valleys of the tributaries of the Meuse, when these were surrounded by relatively high limestone masses (for a similar case in Britain, see Hyaena Den in chapter 3). These cliffs might have played a protective role against the cold north and north-westerly winds and thus have created an attraction for populations of trees, herbivores that were associated with more closed environments and of course Neanderthals. This is especially obvious if we examine the case of the inferred environment for the WFL locus in Veldwezelt-Hezerwater. Although the occupation takes place in a period of climatic amelioration and is situated in a valley of a Meuse tributary, there is no sign of the existence of forested environments and the species associated with them. It seems that the gentle elevation of the Hezerwater valley slopes was not enough to create the protected environment that would exhibit the characteristics of a refugium.

The fact that there are at least two chronologically distinct Neanderthal occupations in Belgium, during MIS 3 is reminiscent of the case of Britain. In both areas we see an initial return of Neanderthals (Lynford in Britain, TLB in Belgium) with the first warming in MIS 3, a possible re-abandonment and a return later within the same period. In both cases the sites that represent the initial re-colonisation are open-air. Although this might be the result of sample bias, there is a possibility that it is related with the nature of these first re-colonisations. I would expect these to have an exploratory character, which would involve greater mobility and hence result in more open air sites. It would be interesting in the future to re-visit this subject with more refined dates and even new sites and explore more the question whether the re-populations of these two areas were connected. If the re-population of North-Western Europe by Neanderthals, in the course of MIS 3, happened in the way proposed in this thesis, it is likely that Neanderthals would have passed through Belgium before reaching Britain every time they re-populated this part of Europe.

Now, in terms of the site typology, also proposed in chapter 2 of this thesis, the following observations can be made. The types of sites that were identified in Belgium were: *rest/recreation/observation sites* (Scladina-1A and the TLB loci) and *meat consumption/resources processing sites* (Trou du Diable). In the case of the WFL locus, due to the nature of the bone assemblage, it is difficult to say if this is a *kill/butchery* site, or a *rest/recreation/observation* site. The most interesting thing highlighted by this site though is the potential of *rest/recreation/observation sites*, when they are located very near to water. This potential is both for the acquisition of meat from herbivores, but also for competition with carnivores. In this sense the WFL locus might constitute a different category on its own. This could be termed *predation sites* and it would include sites near water sources, where there are indications for Neanderthals and hyaenas competing for meat. In the case of Belgium, like in the case of Britain, we witnessed an important role played by hyaenas, in relation to Neanderthal occupations. Hyaenas were always present at the same sites, although most of the time it is difficult to explore the possibility of strict contemporaneity between the two species.

In none of the cases of the above mentioned sites do we know of any contemporaneous sites in the surrounding area that could be possibly attributed to any of the other types, used in the classification proposed in this thesis. In this sense, surveys of the immediate range of a few km around these sites might provide an interesting research avenue for the future.

The examples of the various site categories, identified in Belgium, will be compared with the respective ones from Britain and South-Western France, if any are identified in this third region, and will be collectively discussed in chapter 6. There, the implications of the climatic associations of the Belgian sites discussed above will also be considered in relation to the associations from Britain and South-Western France and re-evaluations of the two models will be made, if necessary.

CHAPTER 5: THE LATE MIDDLE PALAEOLITHIC IN SOUTH-WESTERN FRANCE

5.1. Introduction

5.1.1. The history of research.

The beginnings and advancement of Palaeolithic research in France, during the 19th century, took place in a parallel manner to those in Great Britain. The gradual association of bones of extinct animals with humanly made artefacts during the first half of the century was transformed to a more systematic exploration of the Palaeolithic past after 1850. In South-Western France specifically the first excavations of Palaeolithic sites were conducted in 1816 by François Jouannet who was actually interested in Gallo-Roman antiquities. He was the first to excavate in the later renowned sites of Pech-de-l'Aze and Combe Grenal, where he discovered stone tools and animal bones (Groenen, 1994).

It was much later though, in 1863 that a more conscious exploration of the caves and rock-shelters of the area began by Lartet (Trigger, 2006). After Lartet's excavations in Aurignac established beyond any doubt the association of extinct animals and humans, he set out to excavate more sites with the purpose of producing an evolutionary sequence for the area. His interpretation was based on palaeontology more than anything else, so he devised a chronological scheme based on the animals present in different deposits. This scheme comprised of four periods from younger to older: The age of aurochs, the age of reindeer, the age of mammoth and woolly rhinoceros and the age of cave bear. Later Lartet unified the latter two categories.

His work was continued by Gabriel de Mortillet (1821-1898) who was more interested in producing a sequence based on the cultural remains of human activity. His scheme included from younger to older the Magdalenian, the Solutrean, the Mousterian and the Chellean, the names deriving from type sites where the artefacts had been discovered. De Mortillet was succeeded by Denis Peyrony, who worked more or less within the same cultural-evolutionary framework, but also made the first really systematic stratigraphic observations. In this sense Peyrony, whose career spanned the first half of the 20th century, can be characterised as the link between the “grandfathers” and the “fathers” of Palaeolithic research in South-Western France.

From 1950 onwards the foundations were laid for the Palaeolithic archaeology of South-Western France as we know it today. Bordes and Bourgon started working on a classifying system for the Middle Palaeolithic assemblages (Bordes and Bourgon, 1951) that later resulted in the famous Bordes’ typology (1961a) for the Lower and Middle Palaeolithic. In Bordes’ typology all the lithics with secondary working were deemed retouched tools and assigned a distinct type name. Each type was supposed to be a specific mental template in the mind of the knapper. He then went on to statistically analyse the relative proportions of these types in different Neanderthal assemblages from South Western France. Thus he came up with his five famous groups of Mousterian (Bordes, 1961b). Bordes’ analysis made possible for the first time what seemed to be comparisons at a finer, quasi-synchronic level. According to Bordes these groups signified different cultural/ethnic identities.

Soon after this interpretation was produced by Bordes, the “New Archaeology” followed in the same path. Lewis Binford entered the debate with his model of functional diversity among Neanderthal assemblages (Binford and Binford, 1969). Binford accepted Bordes’ statistical method, but he put forward a more economic approach. The differences in the assemblages were due to the use of different caves for different activities. In a sense, a form of logistical complexity was proposed to explain the differences in the material remains which were explained in terms of site function.

Around the same time Mellars proposed a chronological explanation for the different Mousterian variants (Mellars, 1969). He maintained that there was clear chronological succession of the variants that were occurring in discrete horizons of the South-Western France sequence. This chronological approach was pushed forward in the 1970s by scientifically rigorous geological studies of the deposits in the rock-shelters of the area (Laville, 1975). These studies culminated in a publication of a chronostratigraphical scheme, using sites with long geological sequences (Laville et al., 1980). From the 1980’s onwards and to date the scheme was further enriched and refined with the production of absolute dates and the correlation of the long Perigord stratigraphies with the marine isotope record (Valladas et al., 1986, Turq, 2000).

Meanwhile the focus in the interpretation of Palaeolithic assemblages of this area was shifted from cultural and functional explanations to ones inspired by the idea of the *chaine operatoire* (Leroi-Ghouran, 1993), a concept developed in the 1960s. The results were studies like those of Geneste (1985) and Feblot-Augustine (1994) who focused on raw material provenance and the reduction stages identified in different materials from one site or layer. In a sense these approaches sought to place hominin behaviour at specific sites within the surrounding landscape, also addressing issues of mobility. Parallel to these developments the idea that different Mousterian variants were a result of different reduction intensity was proposed (Dibble, 1987), while efforts were also made to tie the Mousterian variants to different climatic and environmental conditions (Rolland, 1981).

All the above research trends that developed from the 1980s onwards comprise the study of the Middle Palaeolithic of South-Western France today. Raw material studies and technological studies are combined with studies of stone tool reduction intensity and are used to address mobility as well as other aspects of Neanderthals' behaviour. This behaviour is tied to climatic and environmental conditions and is understood on the basis of the geological chronostratigraphic sequence of this area. This chronological sequence is refined by absolute dates and tied to the marine isotope record (Soressi et al., 2002).

Summarising this section we could say that the area of South-Western France has a Palaeolithic research history, which is as long as the ones of Belgium and Britain. However, being an area with a uniquely rich Middle Palaeolithic record it has been used more than any of the other two areas as a laboratory for testing new methods, ideas and interpretations on this period. As a result many important research developments are correlated with sites of this area.

5.1.2. Criteria for site selection.

The area of South-Western France with the densest documented Neanderthal occupation is Perigord. This is thought to have been an ideal place for hominids to inhabit (Mellars, 1996). Along with the environmental richness mentioned in chapter 2, the abundance of lithic raw material sources and the potential for natural shelter in the caves and rock-shelters of the area corroborates such a view. The river valleys of the area would have the function of corridors for the movement of animal herds and Neanderthal occupation in this area could be connected to the interception of these herds. During the coldest parts of the Last Glaciation, South-Western France could have constituted a refugium for Neanderthal populations, retreating from the North. The sites that are going to be used in this case-study are all located in this area.

Perigord was inhabited possibly since MIS 11 as proposed for the lower levels of the site of La Micoque (McNabb, 2007). The main Palaeolithic occupation of the area though seems to occur from MIS 6 to the end of the Pleistocene. Within this time frame the great majority of the sites come from the Last Glaciation (MIS 5d-2); these are all termed Mousterian in the French literature and very rarely is there more detailed information on their chronology. In the best of cases, a site can be attributed to a different part of the Würm glaciation, which is the equivalent in the continent of the Devensian. Würm II can be considered equivalent to MIS 3. For most of the sites though, even this relative chronological information is lacking (Turq, 2000). For this reason, despite the plethora of Mousterian sites in South-Western France, when it comes to sites securely dated to MIS 3 there are not that many choices. The sites from MIS 3 that are going to be presented here have been chosen for reasons that will be explained at the end of this section. The reason why a time-specific study of Mousterian sites in South-Western France, including comparisons with other areas in Europe is important is explained below.

The existence of long archaeological sequences in South-Western France always encouraged an emphasis on the big picture, especially diachronic change. The Mousterian as understood in South-Western France covers the whole of the Last Glaciation. Time specific studies of behavioural variability in smaller time slices within this period have not usually been pursued. The recent work by Soressi on penecontemporaneous sites from the area concentrated specifically on sites where Mousterian of Acheulean Tradition occurred (Soressi, 2002). This approach can be understood in the context of the culture historical explanations of the Mousterian that have dominated a lot of the French based Palaeolithic research, during the past two centuries. It is the author’s opinion that within such approaches the real extent of the variability existing in specific time and space in the Palaeolithic is masked. This happens because when culture is the main classifying criterion, assemblages of a culturally different character are considered irrelevant, even if they are close in time and space. Thus a view of the MTA in MIS 3 becomes the dominant view of MIS 3. This thesis will attempt to go beyond this kind of interpretation.

Another by-product of the rich Palaeolithic record of South-Western France is that the research taking place in this area has mostly been introspective. Researchers in most of the other areas of Western Europe have constantly used South-Western France as a point of reference in an attempt to fill gaps in the record of their own areas. On the contrary researchers in South-Western France have always felt self-sufficient, thinking that the record of their area was more than adequate to explain itself.

The approach taken in this thesis, where an independent ecological framework is used to assess sites from three different areas, including South-Western France is unique. Britain, Belgium and South-Western France are seen as part of a chronological and spatial continuum and Neanderthal population movement is examined diachronically for all these areas. Moreover the specifics of Neanderthal occupation in each of these areas are understood with the same criteria, namely the site classification proposed in chapter 2. This is considered to be one of the major original contributions of this thesis.

The three sites that were chosen to be studied are: Le Moustier, La Ferassie, which are rockshelters and Combe-Cappelle Bas, an open-air site (Figure 62). The main criteria for choosing these sites were:

a) Their established chronology in MIS 3.

b) The access to published detailed stratigraphic observations and environmental studies.

c) The access to details of the stone tool assemblages either through analysis by the author or through publications.

d) The fact that these three sites are geographically close (30 km or less from each other) and thus there is a potential for correlations within a common spatial framework.

e) The combination of sheltered (La Ferrassie, Le Moustier) and open-air sites (Combe-Capelle). This aims to enrich this study with information from different types of landscape use.

f) The presence of more than one archaeological layer, dating to MIS 3, in each of these sites. This way, diachronic variation for each of these sites can be explored.

g) The possibility offered by these sites to compare occupations with different Mousterian variants (MTA in Le Moustier, Ferrassie in La Ferrassie and Typical with technological affinities to Quina in Combe-Capelle) within MIS 3.

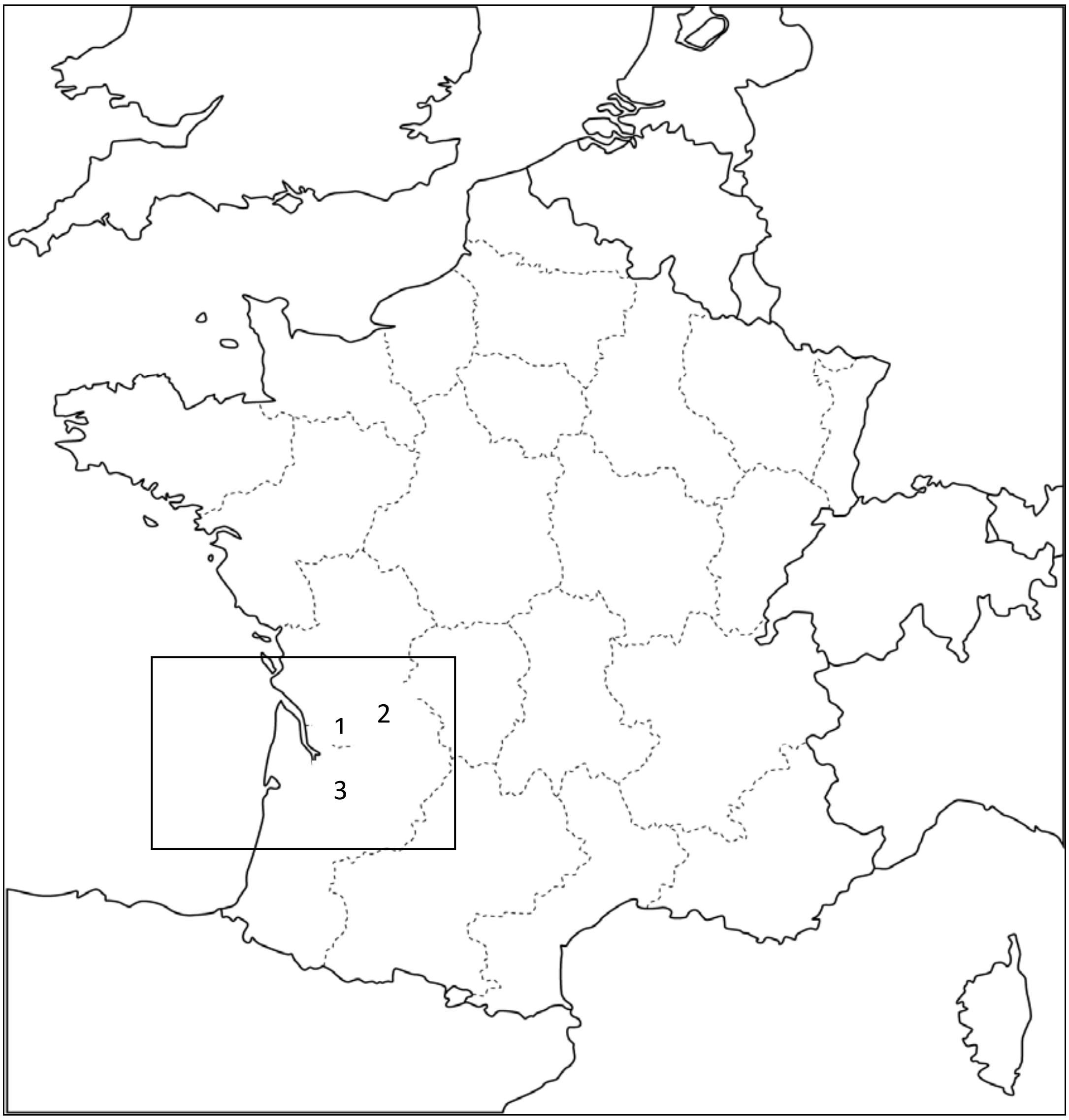


Figure 62: The area of South-Western France with the relative position of the three sites. 1. La Ferrassie, 2. Le Moustier, 3. Combe-Capelle Bas.

5.2. La Ferrassie.

The locality of La Ferrassie is situated in the area of Savignac-de- Miremont between the towns of Bugue and Rouffignac. There are three sites in this locality: a small rock-shelter, a bigger rock-shelter and a cave. The most important is the big rock-shelter, which is examined in this section. This site, which faces south-southwest, is at the base of a limestone hill overlooking the confluence of a dry valley and a small river valley

The exploration of the Ferrassie sites had already started in the last decades of the 19th century, when De Laclause and Riviére excavated mainly in the cave site. In 1896 Denis Peyrony started systematic excavations in the same site and was soon joined by the doctor Louis Capitan. Up to 1905 the excavations were limited to the cave but after 1907 the exploration of the big rock-shelter began (Figure 64). The first stratigraphy from the big rock-shelter was published in 1912, and was complemented by a more detailed version in 1934 (Figure 63).

Peyrony identified the Mousterian at the base of this sequence and more specifically in the layers A, C and D. Layer B was an archaeologically sterile layer composed of calcareous sand. Layer E contained a Chatelperronian assemblage, which at the time was termed as Lower Perigordian. F marked the beginning of the Aurignacian.

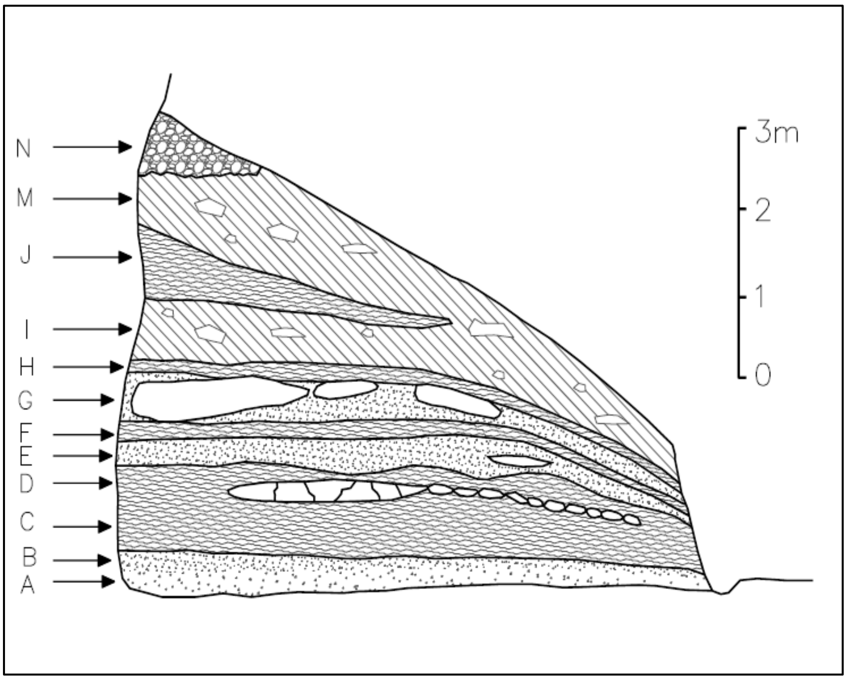


Figure 63: Stratigraphy of the big rock-shelter of La Ferrassie (Peyrony, 1934). Redrawn by Aggeliki Zacharia.

According to Peyrony, layer A contained a Mousterian of Acheulean Tradition assemblage, while layers C and D contained what he initially termed as Mousterian and later as Typical Mousterian. Later Bordes clarified that Peyrony's Mousterian of Acheulean Tradition really consisted of two layers, one with handaxes at its base and one with denticulates at the very top. He also attributed the overlying assemblages from layers C and D to his Charentian-Levallois (Ferrassie) variant (Bordes and Bourgon, 1951). This variant is characterised by a proportionately high use of the Levallois technology and a high number of scrapers.

Excavations at the site between 1968 and 1973 by Delporte have shown that not all the pieces from Peyrony's excavations survive. This could be either due to the fact that the assemblages were divided between different museums or because of selective collection of what was considered to be "characteristic pieces". In this sense, the integrity of the assemblage from layer A seems to be compromised and for this reason it will not be used in this thesis. In any case, given that the chronology of layer C is placed in the transition from MIS 4 to MIS 3 and the fact that layer B is archaeologically sterile, it is very possible that the assemblage with the handaxes in layer A dates from much earlier, and hence is chronologically irrelevant to the study undertaken here. The handaxes being of early rather than late Middle Palaeolithic age is also consistent with the pattern identified by Mellars (1969, 1996), where the Mousterian of Acheulean Tradition overlies Ferrassie assemblages. The examination of a Ferrassie assemblage from South-Western France is consistent with the methodology used in this thesis. Space and time are always taking precedence as criteria for site selection and it is within these dimensions that variability is examined.

One of the most interesting discoveries made by Peyrony (1934) in the complex C and D was a structure, which he described as a paving with limestone slabs, and was the reason why he subdivided the complex in two layers (Figure 63). According to his interpretation this was a real paving made by hominids. No remnants of this structure survived when the more recent excavations took place, hence its interpretation as a structure made by hominids could not be verified. What we can definitely infer from the presence of this structure, whether it was natural or artificial, is a sub-division of the complex that contained the Ferrassie Mousterian in at least two distinct occupations. The results from the most recent excavations showed that this complex is actually sub-divided in more than two units.

Figure 64: The big rock-shelter of La Ferrassie as it looks today. Photo by J.McNabb.

The site of La Ferrassie has also yielded a great deal of Neanderthal skeletal material. From 1909 to 1973 8 Neanderthal skeletons were discovered, mostly complete. These include two adults and 6 juveniles of various ages. The adults were a man aged between 40 and 45 years old and a woman aged between 25 and 35 years old. The juveniles ranged from a newborn baby to a 10 years old child. Heim believes that the Neanderthal fossils from La Ferrassie can be understood as representative of the characteristics of a Neanderthal population (Heim, 1984).

A great deal of additional information on the site has been produced by the systematic excavations in the period 1968-73 and the subsequent multi-disciplinary study of the materials culminating in the 1984 publication (Delport, 1984). This information is presented below.

The 1968-1973 excavations targeted the unexcavated sediments at the back and the side of the shelter (Figure 64). Although the excavators could not locate any remnants of Peyrony's archaeological layer A they managed to establish a correlation between Peyrony's layers C and D and unit M from the new excavations. This unit includes amongst others the layers M2a to M2e and corresponds to a very cold and dry period with indications for some incidents of minor amelioration (Laville and Tuffreau, 1984). All the layers are composed by a high percentage of cryoclastic material embedded in a finer sandy matrix and contain archaeology ranging from 46 artefacts in the poorest layer to 2631 artefacts in the richest. The fauna found in this unit is a cold stage fauna dominated by bison and reindeer and with a few elements of horse. The main carnivores present are cave lion, wolf and fox (Delpech, 1984). The pollen studies showed a flora poor in arboreal elements. The few trees present, pine (*Pinus Sylvestris*) and birch (*Betula*) are both associated with the very cold and dry conditions. There is also an abundant herbaceous element (Paquereau, 1984). The most recent dating of this complex has placed it between 61 and 55 kyr ago based on ESR dates on bovid teeth (Blackwell et al., 2007).

Unit M, which contains Middle Palaeolithic layers dating to MIS 3, was chosen to be examined in this thesis for the extra reason that it will offer us the opportunity to study a Neanderthal occupation related with the Ferrassie variant. The Ferrassie variant is one of the the three Mousterian variants that are more strictly defined (Quina, Ferrassie, MTA), and these are all examined in this chapter. Moreover, there are indications from the environmental data that this is an occupation during a cold period and this is crucial to the argument presented in this thesis for occupation of South-western France, during cold periods. The two layers that will be examined, layers M2e and M2c are the ones with the largest lithic assemblages. The recent excavations were located in remnants of the original layers and hence the assemblages can be only considered as samples. Choosing the largest assemblages was rendered important to ensure that the largest possible samples were examined.

5.2.1. The Layer M2e

The first layer to be examined here is M2e. This is an essentially archaeological layer, characterised by a great quantity of calcined bone particles, which have coloured the sediment dark brown-yellow (Laville and Tuffreau, 1984). It is possible that this aspect of the layer is related to the presence of fire at the site, during its occupation.

Unfortunately, it was impossible to examine the Ferrassie assemblages myself, due to time restrictions. The information on the lithics presented below is based on the data that are available through the published study by Tuffreau (1984). My presentation though, does not follow the Bordian method used by Tuffreau, but the more simplified typology used in this thesis. Whenever information that I would have normally recorded is missing in Tuffreau's study, I will try to infer it through comparison with lithic assemblages I have studied myself.

My interpretation of the data provided by Tuffreau is the following. The lithic assemblage totals 2631 artefacts of which 660 are recognised as retouched tools (Tuffreau, 1984), according to Bordes' classification (1961a). All the artefacts are made on flint. Tuffreau does not mention the presence of any exotic materials, and it is very possible that most of the flint used is local. Another way to test the provenance of the flint would be on the basis of the quantity of cortex remaining on the artefacts. Many artefacts with cortex remaining on their dorsal surface would indicate the first parts of a reduction sequence and hence support a local origin for the flint. Unfortunately, Tuffreau has only recorded the presence of cortex on flake platforms, but not on other parts of their dorsal surface or on other artefacts like cores. The percentage of flakes with a cortical platform, according to his study is only 3%. In my own study of the lithic material from Layers G and H from the lower shelter of Le Moustier, I found that although cortical platforms represented only 4% of the totality of flake platforms, the artefacts that retained cortex on any part of their surface comprised more than 70% of the totality of the assemblage. It is possible that a similar pattern exists for Layer M2e of La Ferrassie. The fact that many flakes from the latter layer retain cortex on their dorsal surface is also apparent from the artefact sketches provided in Tuffreau's study. The use of local materials and especially flint, usually in the form of pebbles or cobbles is very common in the area of Perigord, possibly due to its availability and abundance (Geneste, 1985).

While this lends support a local provenance for the greatest part of the flint found at the site, more recent studies have shown that at least some of the artefacts in the Middle Palaeolithic layers of La Ferrassie have been made on Bergeracois flint (Cleyet-Merle et al., 2007). No published information is known on the details of this association, namely what kind of artefacts are made on this material and what type of cortex they preserve on their dorsal. With the existing information, a collection of this material in the form of pebbles cannot be completely ruled out. Such a pattern, where Bergerac flint occurs in very small quantities in assemblages of this area is confirmed by the other two sites examined in this chapter. It is impossible to explain at this stage how the material reached the sites. All the major rivers of the area, including the Dordogne and the Vezére flow westwards towards Bergerac and the sea. In this sense, the material could not have reached the sites because of fluvial action. A possibility that the material was transported as a result of communication with groups that were based in the area of Bergerac cannot be ruled out, although this contact could have been as rare as the artefacts themselves.

Using the data presented by Tuffreau (*ibid)*, I have analysed the assemblage as shown in Table 20. The assemblage mainly consists of debitage (81%) of which 12% is related to Levallois reduction strategies. There are also 68 cores and core fragments. Of the cores assigned to a specific type, the most common is discoidal. Tuffreau (*ibid*) noted that some of the discoidal cores represented a later stage of a Levallois reduction sequence. The use of Levallois technology at the site is also represented by 7 Levallois cores on flakes. In terms of retouched tools the most common type are scrapers (71%), followed by notches and denticulates (20%) and finally points (10%). Burins and backed knives are represented by one specimen each.

Tuffreau (*ibid)* does not make any reference to flakes from the manufacture of handaxes or spalls from the retouching of flakes in this assemblage. It is possible though that these observations were beyond the scope of his study, which had a strictly techno-typological character. In this sense, although the retouching of tools on the spot is possible in an assemblage that seems to have been manufactured *in situ*, it cannot be regarded as certain. In the case of possible manufacture of handaxes that would be carried elsewhere, only a re-examination of the assemblage with the specific research question in mind could possibly produce an answer.

Artefact Type	**Frequency**
Levallois core on flake	**7**
Discoidal core	**28**
Globular core	**1**
Amorphous core	**7**
Core fragment	**32**
Levallois flake/blade	**262**
Other debitage	**1892**
Point	**29**
Scraper	**268**
Notch/Denticulate	**76**
Burin	**1**
Backed knife	**1**
Naturally damaged piece	**37**
Total	**2631**

Table 20: Frequency of artefact types in La Ferrassie, layer M2e (Data from Tuffreau, 1982).

At this stage I will attempt to provide my own interpretation of the Neanderthal occupation of layer M2e in the context of the site typology presented in chapter 2. The association of a sheltered site with the use of fire, points to the attribution of this occupation to the type c), namely food consumption/resources processing sites. This is the type of site to which Neanderthals would transport meat after a kill and at which they would spend a relatively considerable amount of time. The absence of handaxes and the predominance of debitage could be associated with light-duty butchery, which is expected to have occurred in this type of site. Given the animal associations for this period, it is possible that this butchery involved either parts of bison and horse carcasses or even whole reindeer carcasses that were transported from kill sites. It seems that Neanderthals at La Ferrassie used the local resources of flint to produce debitage, including Levallois flakes and blades, which would have been ideal for the filleting of the meat they acquired from their hunts. During the periods of 3 to 15 days that they would have spent at the site, they would have made scrapers to process the hides of the animals they killed and other materials from plant or wood. In the same time they would have possibly used their notches and denticulates to manufacture spears on which they would attach their stone points. In this sense the site would have also played the role of preparatory station for new hunting expeditions. Given that the site was located at the bottom of a calcareous hill, overlooking the confluence of two river valleys, we cannot rule out the possibility that part of the group would have spent time on top of the hill monitoring animal movement in and out of the valley. The latter two aspects of the preparation for new hunting expeditions and the observation of the animal movements in the surrounding area have been related in chapter 2 to sites of type a), namely the rest/recreation/observation sites.

In this sense it seems possible to identify a merger of site types in Layer M2e of La Ferrassie. Type c) of food consumption/resources processing sites seems to merge with type a) of rest/recreation/observation sites. A possible merging of different types of sites was also seen in the case of Hyaena Den in Britain. It is likely that in the cases of sheltered sites in relative proximity to hill tops the types a) and c) would merge.

All the above questions, regarding the role of the occupation in La Ferrassie M2e, will be further explored in the examination of the next layer from La Ferrassie and the layers from the other two sites, Le Moustier and Combe-Capelle-Bas. The results will be presented in detail in the discussion section at the end of this chapter.

5.2.2. The Layer M2c

The layer M2c is part of the sedimentary complex M2b, from which it is distinguished by its slightly darker colour. It corresponds to the same cold and dry period, as layer M2e described above. There are no bones reported from this layer, while there is no indication from the chemistry of the layer that bones might have existed in the past (Laville and Tuffreau, 1984). The lithic assemblage consists of 401 flint artefacts (Tuffreau, 1984). Again there is no reference in the publication of any exotic materials and most of the flint is probably of a local origin. This is also corroborated by a slightly higher percentage of cortical flake platforms than in layer M2e (4%).

Using data from Tuffreau (*ibid*), I analysed the assemblage as shown in Table 21. The assemblage largely consists of debitage (65%) of which 15% is related to Levallois reduction sequences. There are a total of 18 cores and core fragments.

Again the most common type of core is discoidal, while there is one Levallois core on a flake. In terms of retouched tools, scrapers are again the most common (69%), followed by notches and denticulates (24%), while there are also 3 points and one piercer. Again in this layer there is no mention of retouch spalls or flakes from the manufacture of handaxes. In this case it will also be considered likely that retouching of tools happened on the spot, while in the case of handaxes no inferences can be made.

If we examine this separate occupation of La Ferrassie in the context of our site typology, the following observations can be made. The absence of fire and associated animal bones should rule out an association with the category c) of food consumption/resources processing sites. The category b) of butchery/kill sites can also be ruled out on the basis of the absence of butchered animal bones and heavy duty butchery tools, like handaxes. The remaining category a) of rest/recreation/observation sites remains the most likely association. As it was mentioned above, the top of the hill over the shelter would have been an ideal spot for observing the surrounding area. The presence of debitage may be taken to indicate knapping as one of the communal activities undertaken by the hunting group. Others could have been the preparation of hunting gear. Notches and denticulates could have been used for the making of spears on which the stone points would have been attached, while the preparation of clothes by scraping and piercing hides could have also occurred. The focus of activities on a sheltered location at the bottom of the hill, instead of an exposed location at its top as has been noted for this type of site (type a) in cases like Kent's Cavern, in Britain may be related to the colder climate in which the occupation of La Ferrassie seems to have occurred.

In opposition to the layer M2e which was discussed in the previous section, the layer M2c provides a clear association with one type, namely type a), the rest/recreation/observation sites. Given the fact that the occupation in these separate (M2e and M2c) levels occurred in equally cold conditions and the fact that fire was absent from layer M2c, the two layers seem to differ in terms of Neanderthal behaviour. In other words if these two layers both belonged in the same site category, given the same climatic conditions, both would have required the presence of fire. In the light of this, it is clearer that Layer M2e represents a site of type c), a place where Neanderthals would transport and consume meat, but also where they would perform some activities usually related to the sites of category a), namely preparing future hunts by manufacturing hunting gear and observing the surrounding area, while layer M2c would only correspond with the latter type of occupation.

Artefact type	**Frequency**
Levallois core on flake	**1**
Discoidal core	**6**
Globular core	**2**
Amorphous core	**4**
Core fragment	**5**
Levallois flake/blade	**48**
Other debitage	**264**
Point	**3**
Scraper	**48**
Notch/Denticulate	**17**
Piercer	**1**
Naturally damaged piece	**2**
Total	**401**

Table 21: Frequency of different artefact types in La Ferrassie, layer M2c (Data from Tuffreau, 1982).

It has been made apparent by the examination of these two layers from La Ferrassie that the site did not always retain the same function in the course of Neanderthals everyday range, as some change has been noted diachronically from the older layer M2e to the younger M2c. This pattern will be discussed below in relation to the attribution of La Ferrassie in specific cold episodes, within the period to which it dates.

Something else to be noted at this stage is the possibility of correlations of layer M2e with butchery/kill sites in the surrounding area. There is no reference to such sites in the current literature (Patou-Mathis, 2000, Boyle, 2000) In the case of layer M2c, not only are we missing the butchery/kill sites of this Neanderthal range, but also the sites where Neanderthals would have transported meat after a kill. Judging by the local use of materials, it is possible that these sites would exist within a range of a few kilometres around La Ferrassie. There are three known Palaeolithic sites in a radius of c. 10 km around La Ferrassie. The first is Le Moustier, whose layer H is associated with the type of food consumption/resources processing sites (see section 5.3.2). Unfortunately as we will see Le Moustier, H seems to date much later than La Ferrassie, M (after 46 kyr ago). Another site is the Abri Chadourne, which contains Quina assemblages of unknown date (Van Andel and Davies, 2003, Mellars, 1996), and finally Roc-de-Marsal, which contains Quina asemblages dating to 73,000 ago (Sandgathe et al., 2007). In this sense, there is scope for surveys of the area around La Ferrassie for relevant sites.

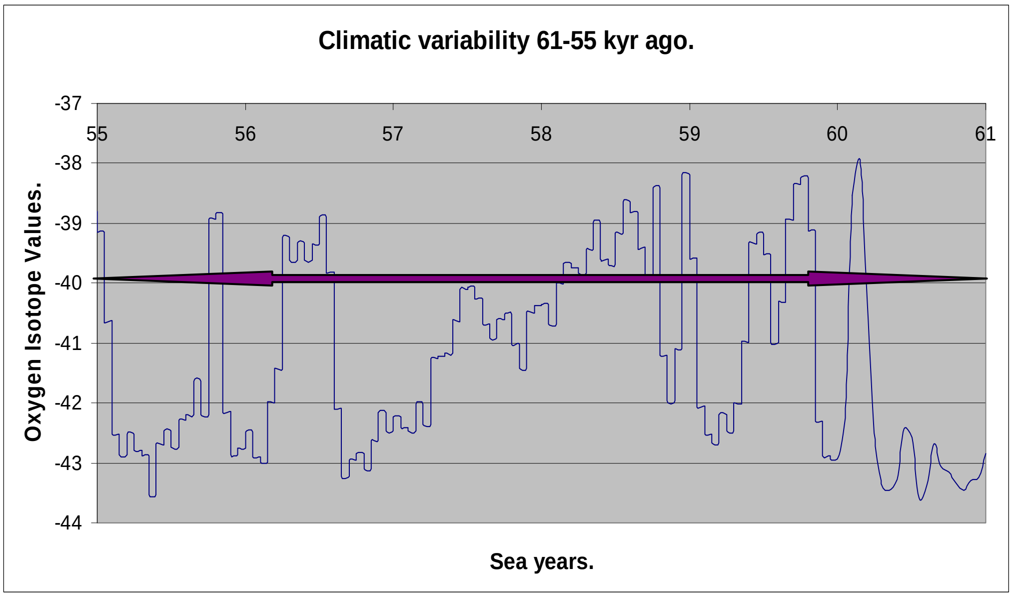


Figure 65: Graph showing the climatic variability between 61 and 55 kyr ago. The oxygen values only rarely exceed -40 and only for short periods. The purple arrow indicates this cut-off value. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

In terms of attributing the two layers of La Ferrassie to specific climatic episodes within their chronological framework, this seems impossible with the present resolution of dates. Figure 65 presents the climatic variability between 61 and 55 kyr ago. As for most of MIS 3, this is a predominantly cold period, where oxygen isotope values rarely exceed -40, which was chosen as the cut-off point to signify climatic amelioration in Chapter 2. In this sense, excluding the few minor warm peaks the occupation of La Ferrassie layers could have occurred within any part of the period in question. The two layers could be representative of different cold events or even different parts of the same cold event. It is interesting to think about the choice of this site to be inhabited in very cold periods in relation to its location. A shelter that faces south/south-west would have at least to an extent protected Neanderthals from the cold North-Westerly winds that would have prevailed during the cold parts of MIS 3 (Barron et al., 2003). The occupation of La Ferrassie during a very cold period in MIS 3 supports the hypothesis put forward in chapter 2 that Neanderthal populations could have persisted in the area of South-Western France, even during the worst climatic deteriorations.

5.3. Le Moustier.

The site of Le Moustier is situated in the village with the same name in the community of Peyzac-le-Moustier. There are actually two rock-shelters at this site, one at a lower and one at a higher terrace, known as the Lower and Upper Shelter of Le Moustier, respectively. Both rock-shelters are carved on the lower edge of a limestone hill at the confluence of the valleys of the Vezére and the Plazac rivers and are facing south/south-east, hence presenting ideal habitats for cold periods (Peyrony, 1930). The Upper shelter was the first to be excavated and is the one after which the Mousterian industry was named. It was excavated successively by Lartet and Christy, Bourlon, Hauser and Peyrony, until there was no sediment left, and the stratigraphy is only known from publications (Soressi, 2002, p.37, Peyrony, 1930). The collections from this site are dispersed and they have not been studied recently. The focus of this section will be solely the Lower shelter for which a great deal of information is available.

The Lower shelter of Le Moustier has an interesting and complex research history and remains today one of the core sites in the construction of the narrative of Middle Palaeolithic occupation in this area. It was discovered by Hauser and he was the first to unearth handaxes at this site (Hauser, 1911), but he did not publish any detailed stratigraphy. Peyrony took over the excavations in 1910 and he was the first to produce a comprehensive stratigraphy (Figure 66). Bordes and Bourgon tested their method of analysis for the Mousterian on the lithic assemblages from Le Moustier for the first time and attributed different Mousterian variants to the layers recognised by Peyrony (Bordes, 1948, Bourgon, 1957). The sequence includes Typical Mousterian, which is defined on the basis that it does not fit in any of the other Bordes' categories, Denticulate Mousterian, which is defined because of the elevated percentage of denticulates and finally Mousterian of Acheulean Tradition A and B. The latter two are distinguished from each other mainly on the percentage of handaxes. While MTA A includes many handaxes and scrapers, MTA B contains a smaller number of handaxes and is rich in backed knives. At the top of the sequence Bordes identified Chatelperronian and Aurignacian industries, which had been termed by Peyrony as Lower and Upper Aurignacian industries following the classificatory scheme of his time.

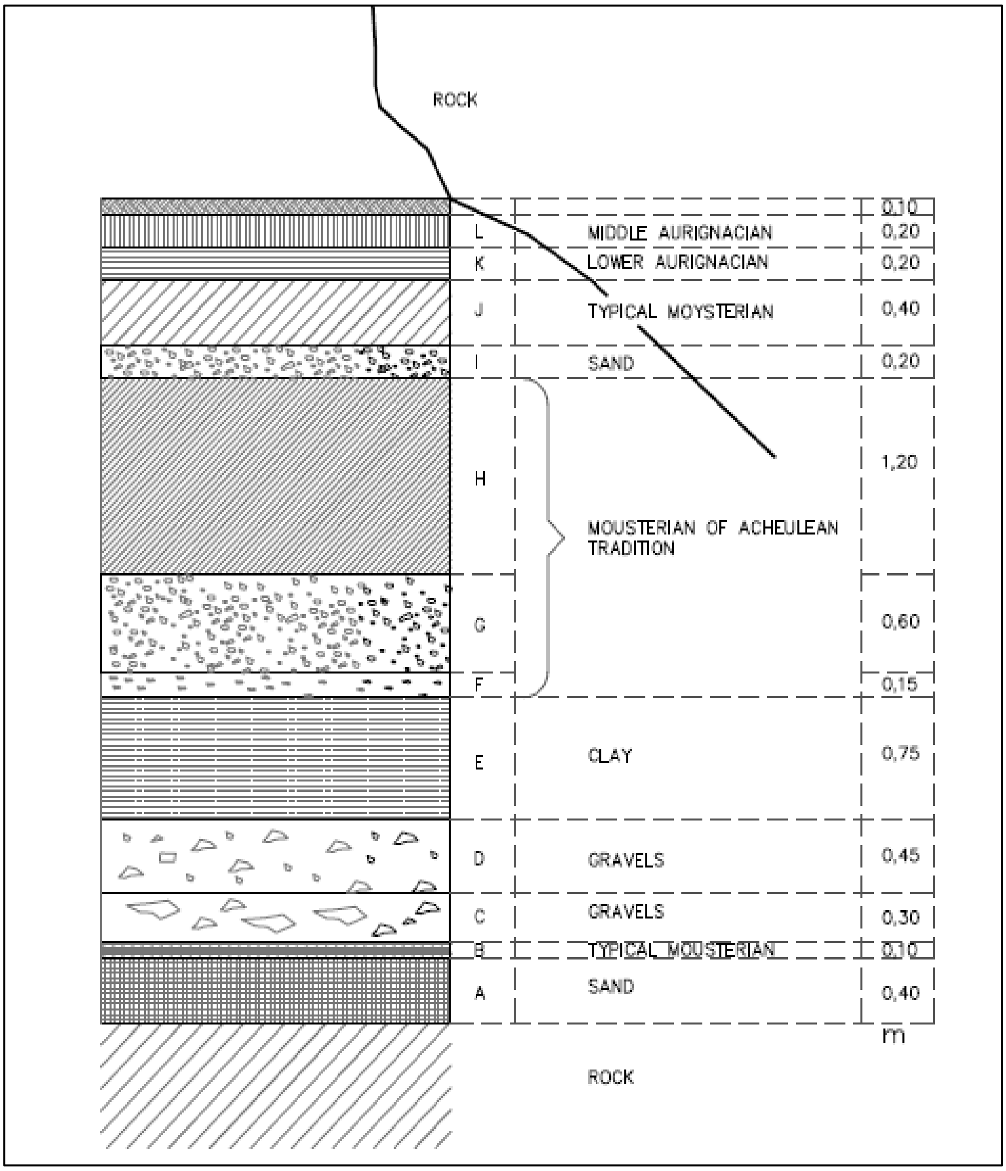


Figure 66: Stratigraphy of the Lower shelter of Le Moustier (Peyrony, 1934). Redrawn by Aggeliki Zacharia and Babis Garefalakis.

Contrary to the case of the upper shelter, where all the sediment was removed in the late 19th and early 20th century, in the lower shelter, unexcavated sediments remained after the end of the Peyrony excavations in 1930. These sediments were examined again in the late 1960's and early 1970's by Laville and Rigaud (1973), who provided a re-evaluation of the stratigraphy for the site. Laville and Rigaud recognised Peyrony's larger stratigraphic units but added smaller sub-divisions and produced new archaeological, climatic and environmental information, based on a more detailed examination of the composition of the layers. This included studies of the sedimentology and pollen profiles from each layer sub-division (Laville and Rigaud, 1973). Both the original observations made by Peyrony and the ones made more recently by Laville and Rigaud will be used in this section.

Two dating programmes have been undertaken at the site of Le Moustier, one by Valladas *et al.* (1986), which produced a series of TL dates for the site and one by Mellars and Grün, which produced ESR dates (Mellars and Grün, 1991). Both programmes were undertaken on samples from the MTA levels of the site. Layer G (MTA A) yielded TL dates in the range between c.55 and c. 50 kyr ago. The ESR dates were significantly younger, pointing to c.47 and 43 kyr ago for the Linear and Early Uptake Models respectively. For layer H that contains the MTA B industry, according to Bordes' definition, the TL dates were in the range between c. 46 and c. 42 kyr ago, while the ESR dates were again younger, c. 41 and c. 39 kyr ago for the Linear and Early Uptake Models respectively. Although Mellars and Grün seem to lean in favour of the younger ESR dates, to date no conclusive evidence has been produced that would prove, beyond any doubt, one set of dates over the other. For this reason, and taking into account the possibilities for new dating developements in the future, the whole chronological range provided by the dates produced by both TL and ESR methods is considered. It is not known at exactly which point in time the occupation of layers G and H of the lower shelter of Le Moustier occurred. Later in this chapter I will make an attempt to shed more light on this issue by comparing the results of both methods and the climatic information from layer G and H with the chronology of climatic events as recorded in ice cores. The details of the actual Neanderthal occupations, together with the rest of the climatic and environmental data are presented in the next two sections.

5.3.1. The layer G (G1-G4)

Layer G was originally described by Peyrony (1930) as a very argilic layer totalling 60cm in thickness and containing limestone fragments of the overhanging shelter, which had been produced by frost action. Peyrony also noted that there was a tendency for these limestone fragments to become larger in the upper part of the layer and to dominate the sediment. In terms of the archaeology, he emphasised the presence of handaxes (coupes de poing).

The stratigraphy was examined in much more detail, during the more recent excavations and was analysed by Laville and Rigaud (1973). According to their findings, layer G is generally homogenous and consists of sand composed of silt and clay elements, as well as numerous and large rolled limestone fragments. It can be sub-divided in four smaller stratigraphic units (G1-G4), on the basis of the fluctuations in the quantity and size of cryoclastic material throughout its thickness, which indicate climatic variability during the period that this layer was occupied. The description of the composition of these sub-layers is given below. The sequence is described from bottom to top:

a) Layer G1 is 15 cm thick and contains cryoclastic material of medium size.
b) Layer G2 has the same thickness as the previous one but contains cryoclastic material of smaller size and in smaller numbers.
c) Layer G3 has also the same thickness and contains a large number of sizeable elements of cryoclastic material.
d) Layer G4 is 10 cm thick and contains cryoclastic material of small size in abundance.

The composition of these sub-layers indicates a generally cold climate, which is in accordance with the conditions that we would expect to encounter in MIS 3. At the same time there are indications in sub-layer G2, where the cryoclastic material seems to be in retreat, for a possible climatic amelioration in the midst of the period represented by layer G as a whole. This pattern seems to be further supported by the pollen samples collected from these sub-layers. Arboreal pollen in G1, G3 and G4 does not supersede 10%, while in G2 there is a boost in arboreal pollen with its count reaching 20% of the total pollen present. A more detailed description of the pollen composition in these stratigraphic units is given below:

a) Layer G1: The arboreal pollen count is equivalent to 10%, with the only arboreal element being pine (*pinus sylvestris)*. The composite *Artemisia* is dominant and is accompanied by other small plants, especially ones that are adapted to dry conditions. In general a largely open environment with steppic elements is indicated.

b) Layer G2: There is a rise in arboreal pollen, which reaches 20%. There is an apparent increase in the numbers of pine, hazel tree, alder, and willow. Elm and lime are found sporadically. In terms of shrubs, the composites are reduced in numbers, while there is an increase in small plants associated with more humid environments. In general the environment could be described as mixed open with several patches of woodland and scattered water stands.

c) Layers G3 and G4: There is a significant fall in arboreal pollen which now is in the level of 8-9% of the total pollen count. Arboreal species identified are pine and some elements of silver birch. The herbaceous element is even more abundant than in layer G1 and is dominated by composites. The environment seems to have a largely steppic character.

If we compare these pollen signatures with the closest geographically long pollen sequences from the area of the Massif Central (Reille et al., 2000) it is confirmed that we are dealing with a series of climatic fluctuations in layer G. According to Reille *et al.* (ibid), the data from the pollen sequence in the Lac du Bouchet crater of the Velay region points to climatic ameliorations taking place within MIS 3. These ameliorations more often than not are characterised by the expansion of pine forest. This type of episode is possibly represented in sub-layer G2. The amelioration is preceded and followed by colder episodes, possibly associated with a more open landscape, similar to the one that is represented by the occupation in La Ferrassie, described earlier.

According to Laville and Rigaud (1973), the archaeology of layer G seems to have occurred evenly and relatively sparsely distributed within the layer sub-divisions, with no indication for complete abandonment of the site at any point. This is of great interest, especially in association with the proposed climatic model in this thesis. The site of La Ferrassie, and more specifically the layers M2e and M2c, gave us the first indication that Neanderthal population persisted in South-Western France, even during the colder periods within MIS 3. In the layer G of Le

Moustier this is demonstrated even more clearly as we have the evidence of consistent Neanderthal presence at the same site, through a period of consecutive climatic fluctuations. As predicted in the model presented in chapter 2 Neanderthal population seems to persist in the area of South-Western France both in warm and cold episodes.

This is further reinforced by the fact that the climatic fluctuations are actually recorded at the local scale of this site, which means that we don't run the risk of generalising climate over areas which could have been more variable, or extrapolating from an area that preserves environmental/climatic data to one which does not. Furthermore, the pollen data from the site are interpreted in a consistent way with other such data from this region.

In terms of animals present in layer G, there is no information preserved on small mammals (Peyrony, 1930, Laville and Rigaud, 1973). The large mammals belong to the following species:

a) Herbivores: bison (*Bison sp./Bison priscus*), aurochs/bison (*Bos/Bison*), red deer (*Cervus elaphus*), horse (*Equus caballus*), reindeer (*Rangifer tarandus*), ibex (*Capra ibex*), wild boar (*Sus scrofa*) and woolly rhinoceros (*Coleodonta antiquitatis*).
b) Carnivores: spotted hyaena (*Crocuta crocuta*), possibly brown bear (*Ursus arctos*?) and finally red fox (*Vulpes vulpes*).

The most commonly represented species are bison and aurochs and they are followed in numbers by red deer and horse. The rest of the animals are represented by very few or in some cases by only one specimen.

The combination of species present indicates a mix of open and closed environments with the bovids, horse, reindeer and woolly rhino being characteristic of the former, while red deer and wild boar are usually associated with the latter. The presence of ibex is probably related to the relief of this area of France, where rocky hills could have been the habitat for this species. The absence of woolly mammoth is interesting, if it's related with Neanderthals' dietary preferences. On the other hand, there is no formal study of the bone assemblage, indicating that it is the result of hunting or otherwise. The bones could have accumulated there naturally and the absence of mammoth may not be related to Neanderthal hunting preferences. In any case, mammoth is not always present in the faunal assemblages of sheltered MIS 3 sites in the Perigord (Stewart et al., 2003), but there are always other large herbivores (bison, horse, rhinoceros) that could have been the prey of Neanderthals. The only other large carnivore, identified with certainty, apart from Neanderthals is the spotted hyaena. Hyaena could well have been the author of the bone assemblage at the site, or at least part of it, but information on gnawing marks is also missing. In general, it seems that Neanderthals and hyaenas were the inseparable elements of the same ecosystem and were always occupying the same territories within MIS 3. This has been also shown in the previous case studies from Britain and Belgium, in chapters 3 and 4.

Having discussed the stratigraphic, climatic and environmental evidence, I will now proceed to describe the lithics found in layer G, during the Peyrony excavations. As mentioned above, this layer was studied by Peyrony first (1930), later Bordes, Bourgon and most recently by Soressi (2002). Peyrony described the types of tools present in the assemblage without calculating their frequencies. The types he described were: handaxes, points, backed knives, scrapers, denticulates, hacking knives (tranchets), notches, end-scrapers, and bolas. He also included a miscellaneous category, in which he placed hammerstones, discoidal and globular cores, and finally debitage. Bordes and Bourgon added more tool types to Peyrony's list and organised them in a statistical interpretive scheme, based entirely on the frequencies of retouched tools, not including other elements, like debitage and cores. The assemblage of layer G was defined as Mousterian of Acheulean Tradition (MTA), on the basis of the statistical dominance of handaxes and scrapers, and was interpreted as an evolutionary link between the Acheulean and the Mousterian. The MTA included two sub-divisions, A and B, with layer G representing sub-division A and layer H sub-division B. Soressi on her part set out to understand the similarities and differences between the two sub-divisions of the Mousterian of Acheulean Tradition in terms of technological choices. For this reason she examined aspects of the assemblage of layer G, including retouched tools, and debitage from a technological point of view, with the greatest emphasis placed on the handaxes.

The description that follows is mainly based on my own study of a sample of this lithic material, which was conducted with particular reference to my own research questions. These are focusing on the meaning of the stone tool occurrences in layer G in relation to site-function, within a specific Neanderthal home range as this would have been influenced by the prevailing climatic and environmental conditions. Complementary information from the previous studies will be used to the extent that this is deemed necessary for the resolution of the issues addressed in this thesis.

The whole of the material from the Peyrony excavations at the lower shelter of Le Moustier is housed at the National Museum of Prehistory at Les Eyzies de Tayac in France. The collection from layer G is classified and archived into boxes, each box containing a separate category of artefacts. I recorded only a 10% sample of the assemblage, due to time restrictions. A random sampling technique was rejected on the basis that such a small sample would not necessarily give a representative view of the assemblage. Instead, I proceeded by sampling 10% of each labelled box, taking a sample, which is proportionate as to the frequencies of different types of artefacts present in the assemblage. Consistency in the recording of other important variables, like patination, cortex quantity and quality, and finally artefact dimensions was maintained by carefully studying all the artefacts from each box before choosing which ones to record. My aim was to make sure that the 10% recorded was as representative as possible of the general variation seen in the artefacts present. As a result of this sampling technique more emphasis will be given on qualitative than quantitative interpretations, something that is compatible with the methods used in previous chapters of this thesis. More specifically, if the emphasis is placed on the whole range of activities taking place at a site, rather than trying to identify the statistically dominant activity, examining a small controlled sample can prove as good as studying the whole assemblage.

The assemblage from layer G consists of 2750 pieces (pers.obs.). The 275 artefacts in the sample recorded (Figure 67) are in various stages of wear, indicating an assemblage formed as a palimpsest and not as a result of a single episode. This pattern of variations in artefact conditions is consistent throughout the whole of the assemblage. The artefacts are made mainly on flint, of local origin, while it also includes very few artefacts on quartz also of local origin and 3 artefacts made on flint, which occurs, in primary position, in the Bergerac area, 45 km away (Soressi, 2002 and pers.obs.). The local flint is of the Senonien type found in abundance in local deposits (Soressi, 2002).

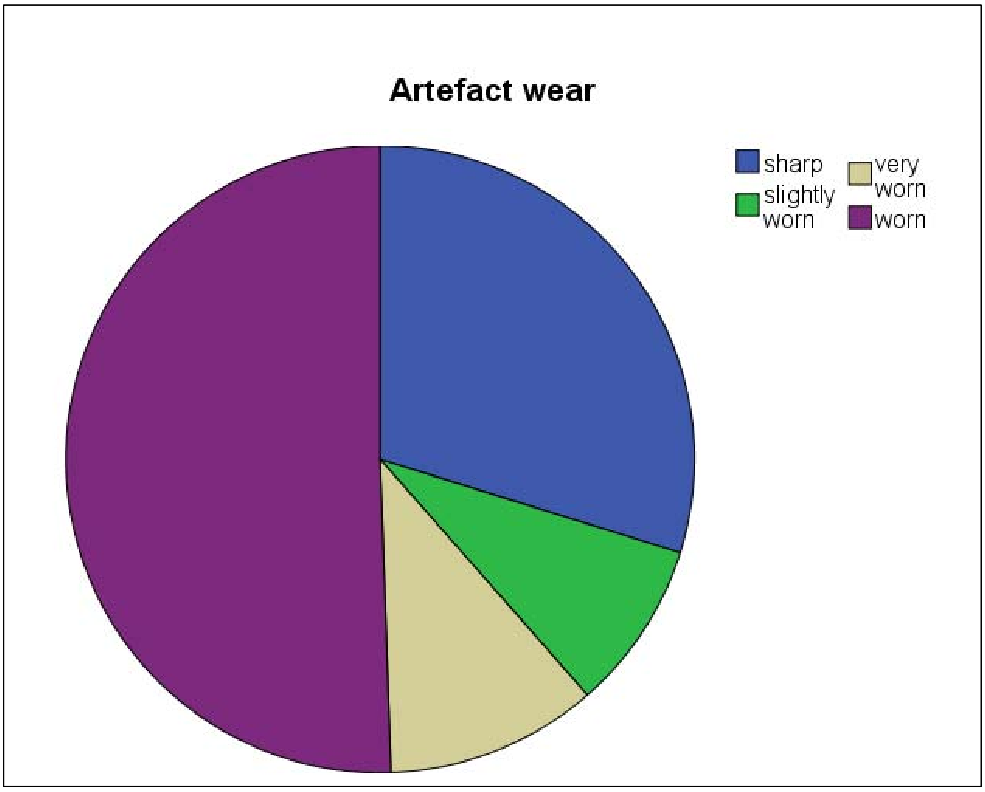
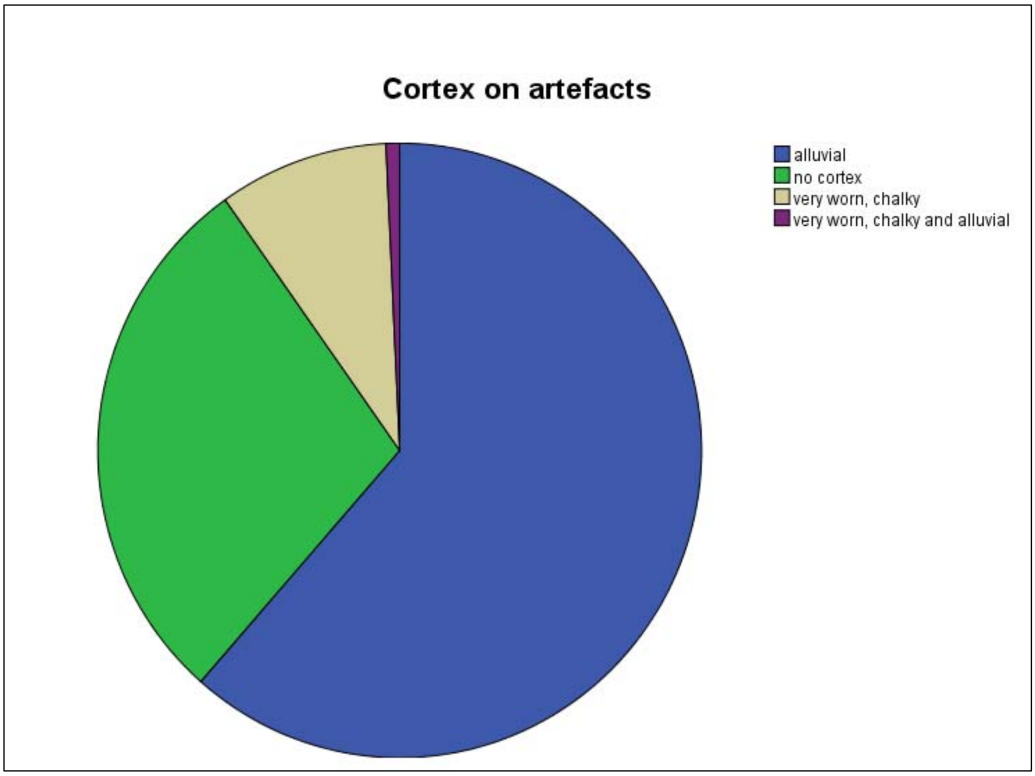


Figure 67: Different stages of wear recorded on the artefacts in the sample from layer G in Le Moustier.



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igure 68: Type of cortex recorded on the artefacts from the studied sample of Layer G (pers. obs.)

In the sample of 275 artefacts, studied by the author, the great majority (70%) retain at least some quantity of cortex on their dorsal surface (Figure 68). This is, in most of the cases (86%), alluvial, pointing to the collection of local pebbles as the main raw material source. Some of the artefacts (13%) retain cortex of a very worn, but chalky nature that could be related with the collection of exposed flint material from outcrops in the area. In two artefacts in this sample though, it was observed that alluvial cortex and cortex of a very worn but chalky nature co-existed. This could be interpreted as differential alteration of the cortex on the same cobble or pebble in relation to its life history in a river bed. In the light of this, the pieces with very worn and chalky cortex will also be considered as deriving from river cobbles/pebbles. Alluvial cortex was also recorded on a piece of flint form Bergerac in this sample

Recorded Object	**Frequency**	**Percent**
Amorphous core	3	1.1
Backed knife	6	2.2
Broken handaxe	4	1.5
Chopping tool	2	0.7
Core on flake	1	0.4
Debitage	90	32.8
Debitage from handaxe manufacture / maintenance	7	2.5
Denticulate	22	8.0
Discoidal core	13	4.7

Discoidal debitage	32	11.6
Flaked flake	2	0.7
Geofact	1	0.4
Globular core	1	0.4
Handaxe	14	5.1
Levallois core	11	4.0
Levallois core on flake	2	0.7
Levallois core-scraper	1	0.4
Levallois debitage	6	2.2
Levallois point	1	0.4
Notch	10	3.6
Partial handaxe	1	0.4
Piercer	2	0.7
Scraper	43	15.6
Total	275	100.0

Table 22: Type of recorded objects in the sample from layer G.

In this sense, it is possible to assume that the Bergerac flint was also collected in the form of pebbles. We saw that a few pieces of Bergerac flint were also found in the assemblages from La Ferrassie. As mentioned above, it is very difficult to adequately explain the presence of this material in the area. Rare communication with groups in the area of Bergerac cannot be ruled out. This does not change much the mainly localised occupation of layer G in Le Moustier.

Table 22 presents the frequencies of different artefact types recorded in my sample from layer G. As mentioned above the sample is proportionate with relation to this variable and should be understood as a more or less accurate representation of the totality of the layer G assemblage. It contained a significant quantity of debitage (38%), including examples of Levallois, discoidal and handaxe reduction sequences, all applied on the local flint. These were accompanied by the presence of discoidal cores, Levallois cores and handaxes. The only artefact on flint from Bergerac in this sample is a raclette, according to Bordes' typology. This type of artefact has been associated in technological studies with the reduction of handaxes (Pelegrin pers.comm., 2007). No handaxes in this material are found in the assemblage though, so if a handaxe was made on this type of flint, it was probably discarded elsewhere.

In terms of tools the most common type is the scraper (15.6%), followed by denticulates and notches (11.6%), handaxes (7%), and backed knives, piercers and points in much smaller percentages, with all the percentages based on the total number of artefacts recorded. No evidence is present for the retouching of artefacts *in situ* in the form of retouch spalls. This is possibly a true pattern, given the actual dimensions of the artefacts collected in the Peyrony excavations, as shown in table 23. It seems that a great range of artefact dimensions are present and such artefacts should have been collected if they were there.

Dimensions of artefacts	**Minimum**	**Maximum**
Length (cm)	2.4	13.2
Width (cm)	2.0	9.6

Table 23: Minimum and maximum dimensions of artefacts in the sample from layer G (pers.obs.).

To sum up the information from the lithics in layer G of Le Moustier, we could say that Neanderthals occupied this site, using materials from the surrounding area. They made handaxes and flake tools on these materials and produced debitage employing discoidal, and Levallois reduction sequences. They possibly used these artefacts on the spot and discarded them, when they were not useful anymore. They also made or repaired handaxes that were finally discarded in a different location in the landscape.

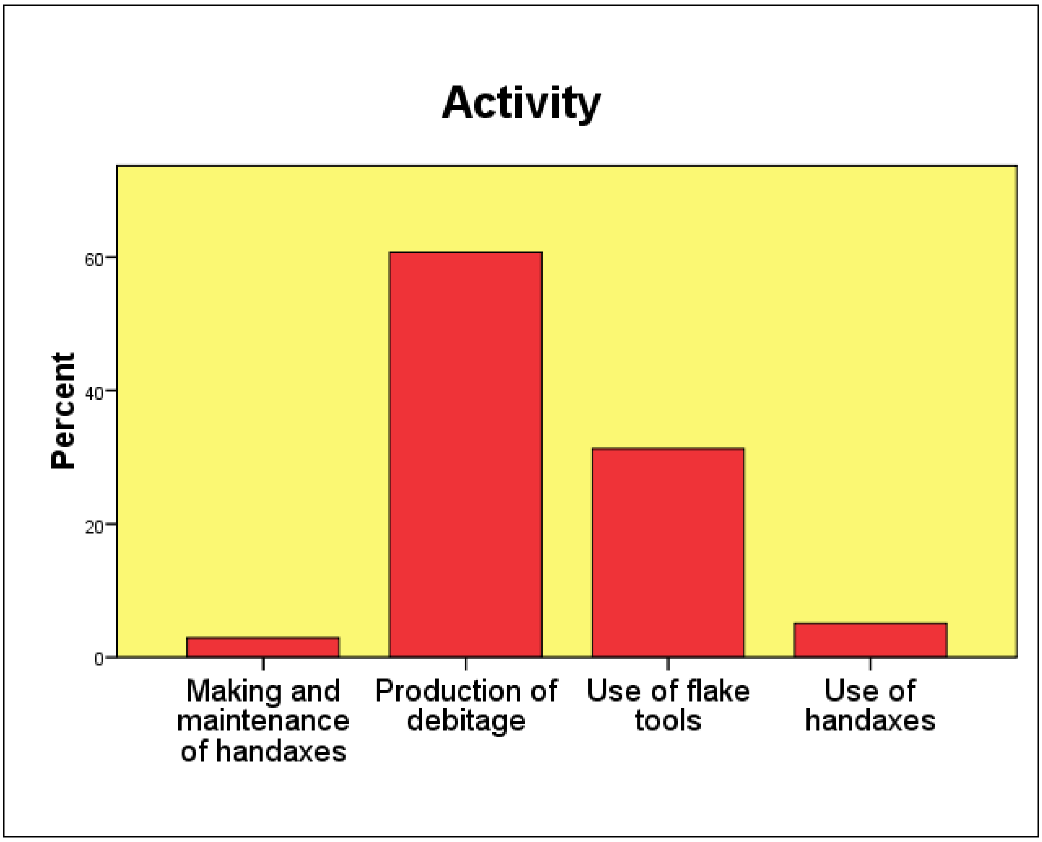

Figure 69: Summary of activities performed in layer G of Le Moustier, based on the lithics (pers. obs.).

Figure 69 shows a summary of the activities performed at the site as these are inferred from the lithics present. The actual manufacture of tools, in the sense of retouching is not included, due to the lack of retouch spalls. The presence of handaxes and retouched tools is interpreted as use of these elements at the site. All kinds of debitage and cores are included in the production of debitage category. Flakes from the manufacture of handaxes and broken or partial handaxes are included in the making and maintenance of handaxes category. Production of debitage seems to have been by far the most common activity in this rock-shelter, represented by 60% in this assemblage. It is followed by the use of flake tools, which takes up a 30%. The making, maintenance and use of handaxes only take up a 10% of the assemblage.

Now if we try to understand these associations in terms of the site typology proposed in this thesis the following thoughts can be expressed. The emphasis on the production of debitage and the presence of backed knives could be associated with the occurrence of light-duty butchery at the site. It was mentioned above that no mammoth bones were found at the site and the possibility was raised that mammoth meat filleting could have happened away from this shelter. Given though that there is no direct evidence at this stage of research pointing to the anthropic origin of the bones in layer G, it should be considered possible that no butchery occurred at this site at all. In such a case the debitage and backed knives would probably have been used in other processing activities. An insight in the types of these activities is given by the flake tools present. Hide processing could have been performed with the scrapers and piercers, while wood processing could have probably been undertaken with the notches and denticulates. Furthermore, micro-wear studies on handaxes found in sites in the same area, containing MTA A assemblages have shown that these implements were used on meat, hides and wood (Anderson-Gerfaud, 1981). It is possible that the handaxes in Le Moustier were also used on such materials and hence they were not a *sensu stricto* butchery tool.

Given the fact that butchery of carcasses or meat storage cannot be safely inferred for this layer, the argument for a possible attribution of layer G to the site category c) of my classification, meaning the sites where Neanderthals carried meat after a kill is significantly weakened. Against such an attribution is the absence of fire in the form of hearths or even dispersed carbon elements in the sediment. We can infer that at some point there was fire at the site, because part of the absolute dating for this layer has been done on burnt flint (Valladas, *et al.*, 1986), but there is no clear indication that this was not a natural fire.

An association of this occupation with the sites of category a) defined in this thesis as rest/recreation/observation sites, seems more likely. It is possible that Neanderthals at Le Moustier were processing hides from previous hunts to make clothes and wood in order to prepare hunting gear for future expeditions. Part of these preparations would have also been the manufacture of points at the site, some of which would have probably been hafted on wooden spears and carried away to be used on hunting trips. Alternatively, weapons with points could have been used at the site in confrontation with hyaenas and other carnivores that might have also claimed this shelter. According to Soressi's study (2002) of the material from this layer, hafting of tools would have been pretty common and it is possible that part of the woodwork was aimed to that direction. In this context the activity of knapping at the site would not only have played the role of the production of blanks for retouched tools or flakes to be used as tools directly. It would have also played the role of a communal activity that would have bonded the group together in anticipation of starting a new expedition. The outcome of another possibly communal activity was identified in this layer by Peyrony. He identified the remains of colouring materials in the form of manganese dioxide and a piece of rock which had been coloured. The use of colouring materials can be considered as one more activity that could have occurred in Neanderthal hunting stands as a way of passing the time or a possible bonding activity.

Figure 70: The view from the Upper Shelter of Le Moustier. Photo by J.McNabb.

While it has been made apparent from the above that the occupation of layer G in Le Moustier could well fit site category a) in relation to activities relating with group bonding and recreation, it still remains to examine the advantages of this location in relation to observation of animal movement. It is possible that the key to that is on the occupation that has been recorded on the higher terrace at the upper shelter of Le Moustier. Layers containing Mousterian of Acheulean Tradition have been identified at the bottom of this sequence and it is possible that they are related to the lower shelter occupation as well. Unfortunately no absolute dating exists for these layers that do not survive today, while their collections of stone tools are dispersed between museums and private collections and have not been properly studied. If though they are associated with the lower shelter occupation, it is possible that we are dealing here with a case similar to the one described in chapter 3 for the site of Oldbury in Kent. There, two separate possibly related localities were identified one at the base and one on the slope of a hill. The interpretation, proposed by this author, was that the slope locality could have functioned as an observatory for the movement of animals in the surrounding area and it is possible that we are dealing with a similar case at the upper shelter of Le Moustier (Figure 70).

Finally, in terms of the climatic episodes in which the occupation of layer G occurred, the following observations have been made. The stratigraphic sequence from this layer records a mild climatic amelioration (G2) between two cold episodes (G1 and G3-G4). According to the TL dates from layer G the Neanderthal occupation of this layer seems to have occurred between c. 55.8 +/- 5.5 and 50.3 +/- 5 kyr ago. Figure 71 is a graph with the climatic variability from the period between 55.8 and 50.3 kyr ago, based on data from the NGRIP.

Using the definition for climatic ameliorations I proposed in chapter 2 (Oxygen Isotope values >-40), a mild episode is identified between 54.9 kyr ago and 52.4 kyr ago, preceded and followed by cold episodes. In this sense the NGRIP climatic data is consistent with the sedimentological and pollen analytical results in layer G of Le Moustier, if we accept the time bracket provided by the means of the TL dates.

The ESR dates on the other hand with the Linear Uptake model favoured by Mellars and Grün (1991) place the same occupation between c.51 and 42 kyr ago. More specifically dates obtained on a sample provenanced in layer G2, which represents the climatic amelioration give a range between 49 and 45 kyr ago. Figure 72 is a graph showing the climatic variability in the period between 51 and 42 yr ago. Two climatic ameliorations are identified in this period, one between c.47 and c. 46 kyr ago and one between c. 44 and c.43 kyr ago. The data provided by sedimentology and palynology though support the occurrence of only one climatic amelioration in layer G. A possible explanation for this could be that the second amelioration was not of enough magnitude and duration to leave its traces in the generally coarse datasets of sediementology and palynology. In this sense the younger chronology proposed by Mellars and Grün (*ibid*) could also be supported on the basis of the ice core data.

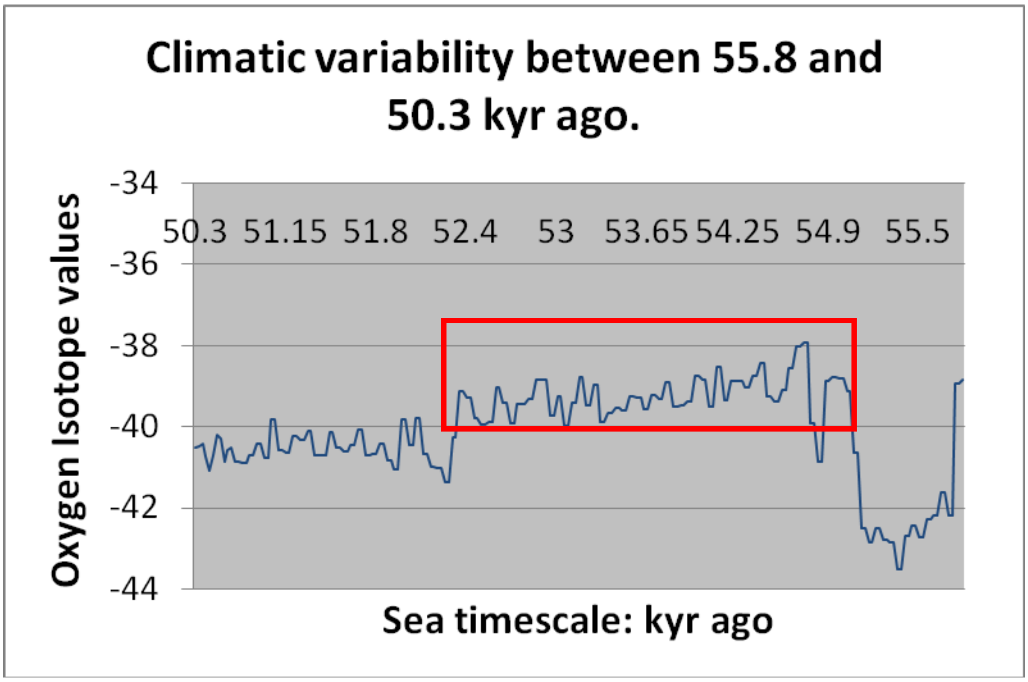

Figure 71: Climatic variability between 55.8 and 50.3 kyr ago. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

At this stage, I would like to propose an alternative explanatory scheme for the chronology of layer G, in an attempt to combine the results of both dating techniques in a way that does not contradict the evidence from the ice cores. If instead of using the means of the dates produced by TL, we used the younger margins of the standard deviation of these dates, the chronological range for layer G would be between c. 50.8 and c. 44.8 kyr ago. Such range is within the margins set by the younger ESR dates (Figure 72) and is consistent with only one climatic amelioration occurring, during the period layer G was forming. Of course, this is just a heuristic scheme and cannot be proven in any way at this stage. More dating studies in Le Moustier with new and improved methods may resolve this issue in the future.

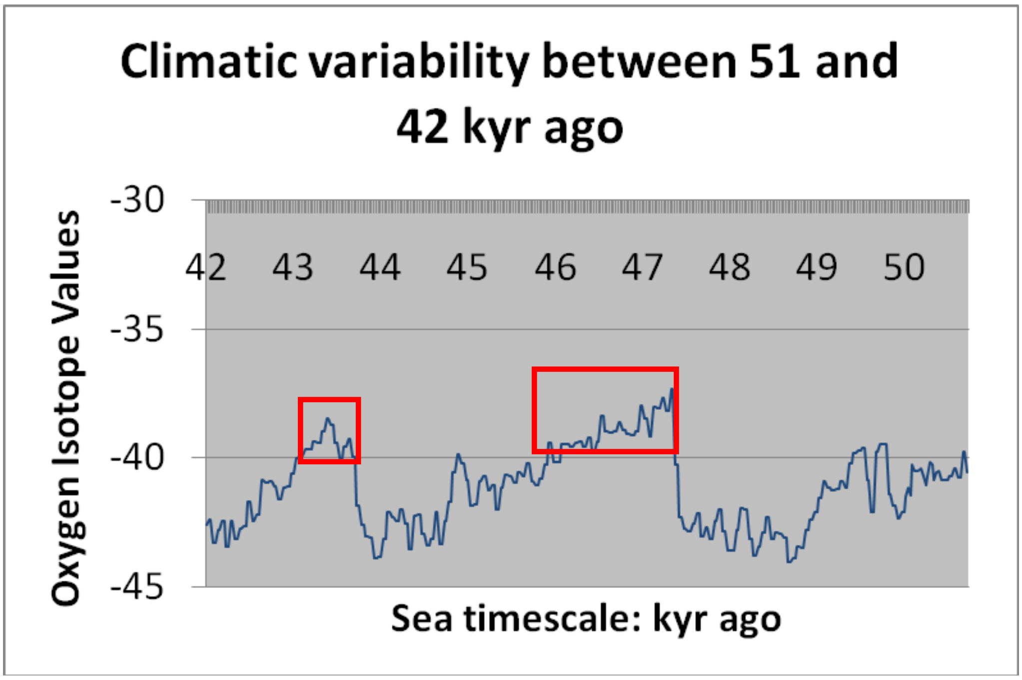

Figure 72: Graph showing climatic variability between 51 and 42 kyr ago. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

5.3.2. Layer H (H1-H9)

Peyrony (1930) described this layer as very brown at the base with a lighter colour towards its top. Its thickness varied between 1.20 and 1.30 m. Peyrony also noted the presence of numerous hearths composed by calcined bones and ashes. The great quantity of debitage and knapping debris made him characterise this layer as a possible workshop.

Laville and Rigaud (1973) described layer H as a heterogeneous formation, where we find superimposed layers of much rolled cryoclastic material, of essentially sandy sediments and numerous archaeological layers. They subdivided the layer in 9 smaller units (H1-H9) from bottom to top. Several of these were further sub-divided into even smaller units:

a) H1 was 15 cm in thickness and contained limestone fragments, resulting from frost action, embedded in sand consisting of clay and silt of dark brown colour.

b) H2, was subdivided in five smaller units:

H2a was 3 cm in thickness and it contained sporadic limestone fragments.

H2b was 15 cm in thickness containing numerous large limestone fragments in a matrix of pronounced clay composition.

H2c was 5 cm in thickness and had the same composition as H2b with slightly less clay.

H2d was 12 cm in thickness and had very few cryoclastic elements in a grey-brown silt and clay matrix. It also contained a great concentration of archaeological remains.

H2e was 10 cm in thickness and contained numerous limestone fragments of small size and in a much rolled condition. It also contained locally stratified gravels. The archaeological remains were dispersed in sand comprising of greater quantities of silt and clay than in the previous sub-layers.

c) H3 was 5 cm in thickness and was a continuous alignment of cryoclastic elements and gravels.

d) H4 was 5 cm in thickness and contained re-worked rolled limestone fragments in sand of clay and silt composition and of dark brown colour.

e) H5 was 4 cm in thickness and was a continuous layer of rolled limestone fragments of small size.

f) H6 was 10 cm in thickness and was a homogenous deposit of sand composed mainly of silt and very little clay and very few cryoclastic elements in a much rolled condition. It contained a very high density of archaeological material and calcined bone at its base.

g) H7 distinguished by its darker colour and sub-divided in four smaller units:

H7a was 3 cm in thickness and contained a continuous layer of rolled limestone fragments of small size.

H7b was 10 cm in thickness and contained re-worked cryoclastic elements of medium size equally rolled, in sand consisting of clay and silt. Flint and bones were rare in this layer.

H7c was 3cm and in thickness and was a discontinuous layer of small limestone fragments and gravels.

H7d of unrecorded thickness contained numerous cryoclastic elements in sand composed of silt and clay. It contained rare archaeological remains.

h) H8 was 7cm in thickness and contained very few limestone fragments of very small size embedded in sand composed of clay and silt with a dark grey-brown colour. It contained in its middle part a rich archaeological deposit which gave the sediment a darker colour.

i) H9 was 15 cm in thickness and it contained rare gravels and cryoclastic material in a sand matrix composed of clay and silt, with a dark brown colour. Flint artefacts and bone splinters were generally dispersed in this layer but in certain cases formed localised lenses.

The patterns emerging from this stratigraphy are the following. Neanderthal occupation seems to have occurred in a cold period, as indicated by the presence of cryoclastic material of various dimensions and variable quantities in all layers. The matrix of the layers was formed by a combination of weathering of the natural rock, which contributed the clay element in the sediment and the action of water as indicated by the presence of silt and sands in the mixture. The lower shelter of Le Moustier being located very close to the Vezére would have been in constant interaction with water as the levels of the river would rise and fall. This is also corroborated by the presence of thin layers of gravels, possibly indicating periods when the river would have covered the floor of the rock shelter for considerable amounts of time. Neanderthal occupation in layer H would have taken place in periods when the floor of the rock shelter would be free of water, but still close to the banks of the river. The archaeology consists of stone artefacts and bone splinters usually burnt and associated with ashes that give a greyish colour to the otherwise brown sediment. It is usually concentrated in high densities that show an intense occupation at times, while there are also layers with small and dispersed quantities of archaeology, indicating a more opportunistic occupation at others.

Laville and Rigaud (1973) divide layer H in two climatic periods, according to their sedimentological studies. The first is a cold and relatively humid period and includes sub-layers H1 to H2e. The second is an equally cold but drier period and is manifested in layers H3 to H9.

The division in two climatic periods is also supported by the pollen evidence. This time though the dividing point is at a different sub-layer. Units H1 to H6 contain a pollen assemblage indicative of a cold and humid period. The arboreal pollen in these layers consists strictly of *Pinus syslvestris* (pine), which constitutes a 5-6% of the total pollen count, while numerous are the *Graminae* and *Cyperacae* (grasses). In smaller numbers are found the *Compositae* and *Heliophiles* (shrubs). The second climatic period according the pollen evidence includes units H7-H9 and is a colder and very dry period. The arboreal pollen remains equally low (still consisting of pine), but the grasses disappear giving their place to shrubs and other steppic elements. The association of reduced arboreal pollen with climatic deterioration in the area of South-Western France is supported by the long pollen sequences from Velay in the Massif Central (Reille *et al.*, 2000).

Neanderthal occupation in very cold periods is confirmed by both the interpretation schemes provided by sedimentology and pollen respectively. This is an indication in favour of the hypothesis explored in this thesis that Neanderthals occupied South-Western France even in the colder episodes of MIS 3. Layer H seems to represent a significantly colder period than the ones described in layer G (sub-layers G1, G3-G4), and still Neanderthal population seems to persist in this area. It is also of interest that two of the three largest concentrations of archaeological material in layer H occur in its second part, which is the coldest and driest of the two. This pattern is in conjunction with a possible increase in Neanderthal population of South-Western France, during the coldest episodes, as has already been proposed in this thesis.

In terms of animals present in layer H, there is no information preserved on small mammals (Peyrony, 1930, Laville and Rigaud, 1973). The large mammals belong to the following species:

a) Herbivores: bison (*Bos sp. /Bison primigenius*), aurochs (*Bos sp. /Bison primigenius*), red deer (*Cervus elaphus*), horse (*Equus caballus*), reindeer (*Rangifer tarandus*), ibex (*Capra ibex*), woolly rhinoceros (*Coleodonta antiquitatis*), and a small artiodactyl, which could possibly be roe deer (*Dama dama*) or chamois (*Rupicapra rupicapra*).

b) Carnivores: spotted hyaena (*Crocuta crocuta*).

The most common species again are the ones included in the bovid family, followed by the red deer and then the horse. The remaining species are represented by very few specimens.

As in the case of layer G the information from mammals points to a combination of open and closed environments. This is supported by the pollen evidence, which shows that even in the colder periods some arboreal element was preserved. The only carnivore present at the site except Neanderthals is the spotted hyaena, which as was already noted above is a very common combination in assemblages from MIS 3.

Turning now to the archaeology from layer H, the assemblage that I studied from this layer derives from the Peyrony excavations, and comprises the great majority of the artefacts collected from this layer. Unfortunately, it is not differentiated in the sub-layers recorded later by Laville and Rigaud (*ibid*) and cannot provide the level of detail that would be necessary to describe each individual occupation recorded in layer H.

Peyrony (1930) described the assemblage he collected from layer H as one that included a great quantity of unutilised flakes and knapping waste, associated with some characteristic pieces. The latter were handaxes in small numbers, numerous end-scrapers, backed knives, and notches. Peyrony also referred to the presence of what he characterised as bolas. In terms of cores he recognised discoidal and globular cores. Finally he referred to the presence of tools that could not be easily classified in a category, and hammerstones.

Bordes (1948) on the other hand, applied statistical methods on this assemblage and characterised it as Mousterian of Acheulean Tradition B, on the basis of the reduced number of handaxes, in comparison to layer G and the increase in the number of backed knives.

The presentation of the material that follows is based on my own recording of a 10% sample of the assemblage comprising of the material collected, during the Peyrony excavations and now stored at the National Museum of Prehistory, at Les Eyzies, France. The assemblage from layer H comprises of 4440 pieces and was classified in boxes, according to artefact type, in the same manner as the one from layer G. The procedure I followed for the recording of this sample was the same as for layer G, again resulting in a representative sample with regard to the frequencies of different artefact types (see above). As for the other variables recorded in this layer, I tried to include the whole range of variation in the assemblage, despite the fact that this cannot be necessarily translated into quantifiable results. As in the case of layer G, due to the fact that the artefacts derive from the Peyrony excavations we don’t have their detailed positions to the extent that would allow us to correlate them with the sub-layers identified by Laville and Rigaud (1973). For this reason the interpretations presented here have to be more generalised, referring to the layer as a whole.

The artefacts are in various stages of wear indicating a palimpsest (Figure 73); they have all been made on flint, mainly of the Senonien type, found locally, while a few artefacts have been made on flint from Bergerac deriving from about 45 km away. The predominance of alluvial cortex (93.4%) indicates the use of cobbles or pebbles (Figure 74). The fact that these would have been picked up locally is also indicated by the fact that most of the artefacts are cortical (72.3 %), indicating early stages of a reduction sequence. Some of the artefacts preserve a very worn and chalky type of cortex that could indicate the use of eroded flint from outcrops. Again though, like in the case of layer G, the presence of pieces which retain both alluvial and very worn and chalky cortex on their dorsal possibly means that the material mainly came from river beds, with some of the cobbles being rolled more than others.

Most of the artefacts made on flint from Bergerac do not retain any cortex on their dorsal, and this is consistent with a material that has been transported for longer periods around the landscape and has been reduced accordingly. In one case we have some alluvial cortex preserved, pointing again to the possibility of acquisition of the Bergerac material in river beds. In terms of the range occupied by Neanderthals in layer H, there seem to be no significant differences with layer G. Neanderthal occupation still has a mainly localised focus, with the possibility of rare communication with groups in areas further away.

Table 25 presents the frequencies of different artefacts in layer H. The assemblage from this layer is largely dominated by debitage (70.1 %). This includes Levallois debitage, debitage from discoidal cores, and what could possibly be debitage associated with prismatic cores. Also there is some debitage that can be associated with the manufacture or maintenance of handaxes. Discoidal, Levallois and amorphous cores are present, while quite common is the use of flakes as cores. The most common tool type is the backed knife (6.8% of the totality of the assemblage), closely followed by notches and denticulates (6.1%). The next tool type in frequency is the scraper (4.5%), while handaxes or handaxe fragments constitute a very small part of the assemblage (0.6%).

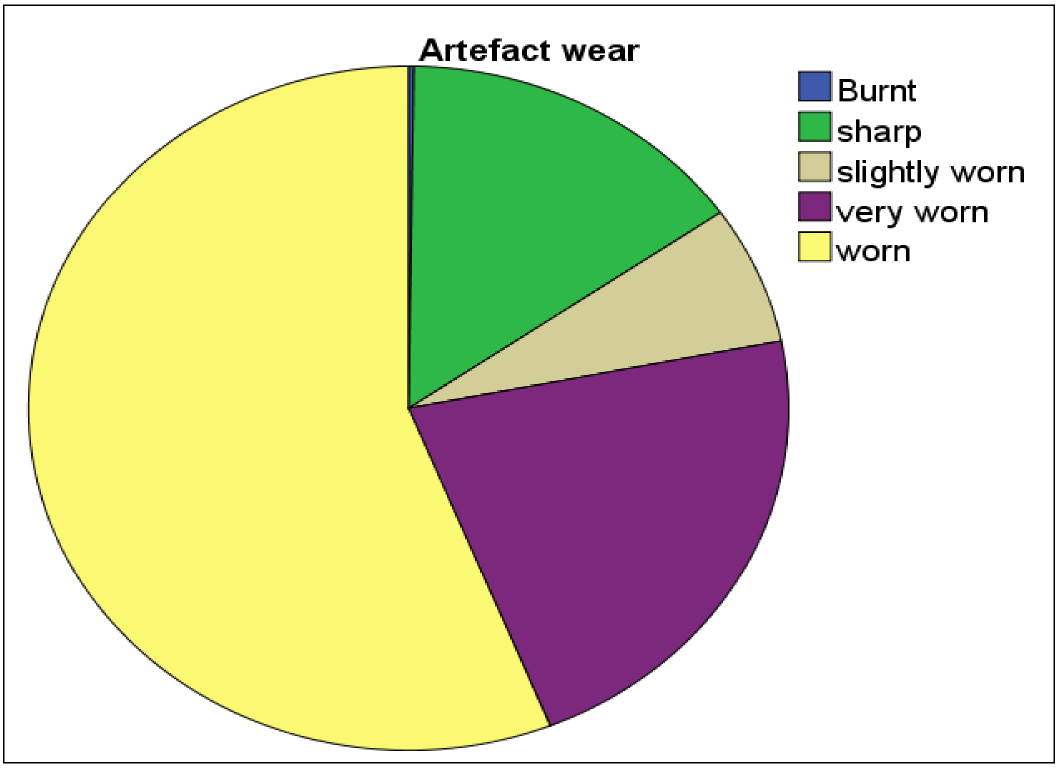

Figure 73: Artefact wear in layer H, Le Moustier (Pers. Obs.).

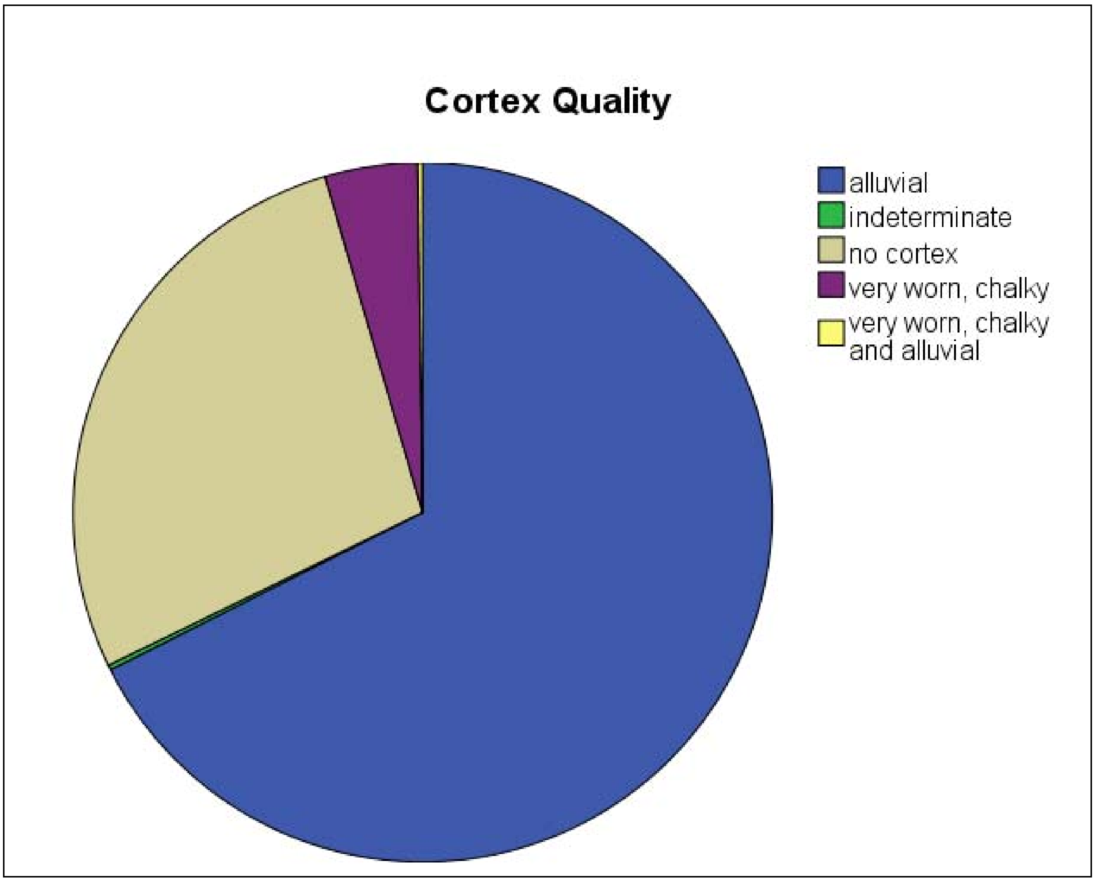

Figure 74: Cortex on artefacts from layer H, Le Moustier (Pers. Obs.)

Dimensions of arterfacts	**Minimum**	**Maximum**
Length (cm)	1.2	13.3
Width (cm)	1.9	11.7

Table 24: Dimensions of artefacts in layer H, Le Moustier (Pers. Obs.)

Type of artefact	**Frequency**	**Percent**
Amorphous core	2	0.5
Backed knife	30	6.8
Broken Levallois core	1	0.2
Burnt artefact	1	0.2
Core fragment	1	0.2
Core on flake	16	3.6
Debitage	223	50.2
Debitage from handaxe manufacture/maintenance	2	0.5
Denticulate	14	3.2
Discoidal core	10	2.3
Discoidal debitage	87	19.6
Globular core	2	0.5
Handaxe	1	0.2
Handaxe fragment	1	0.2
Handaxe tip	1	.2
Levallois core	13	2.9
Levallois debitage	5	1.1
Notch	13	2.9

Debitage from prismatic core	1	.2
Scraper	20	4.5
Total	444	100.0

Table 25: Frequencies of different artefacts in layer H, Le Moustier (Pers. Obs.)

There is no evidence for retouching artefacts *in situ* in the form of retouch spalls. This cannot be explained by a collector's bias in the Peyrony excavations (as above). A great range of artefact dimensions are included in this assemblage (Table 24) and such pieces should have been collected, if they were present. As in the case of layer G, it is most likely that the absence of these artefacts is related to post-depositional processes.

To sum up the information offered by the lithics in layer H we could say that Neanderthals used local materials to produce debitage, and produce and maintain handaxes at the site. They also used retouched tools on local materials that they probably produced in the vicinity of the site and discarded them *in situ*.

Figure 75 is a summary of the activities performed at the site. The production of debitage is by far the most common activity followed by the use of retouched tools. Activities, related to the making and use of handaxes are very limited. It is interesting to note at this stage the changes occurring from layer G to layer H. The only activity that is intensified is the production of debitage, while all the others seem to become less important, with the most significant decrease observed in the activities related to handaxes (Table 26).

Layer	**Tools**	**Non tools**	**Total**
Layer G	108	167	275
Layer H	80	364	444

Table 26: Proportions of tools (including retouched flakes and handaxes) in relation to the other artefacts in layers G and H (Pers. Obs.) A clear difference between the two layers is detectable.

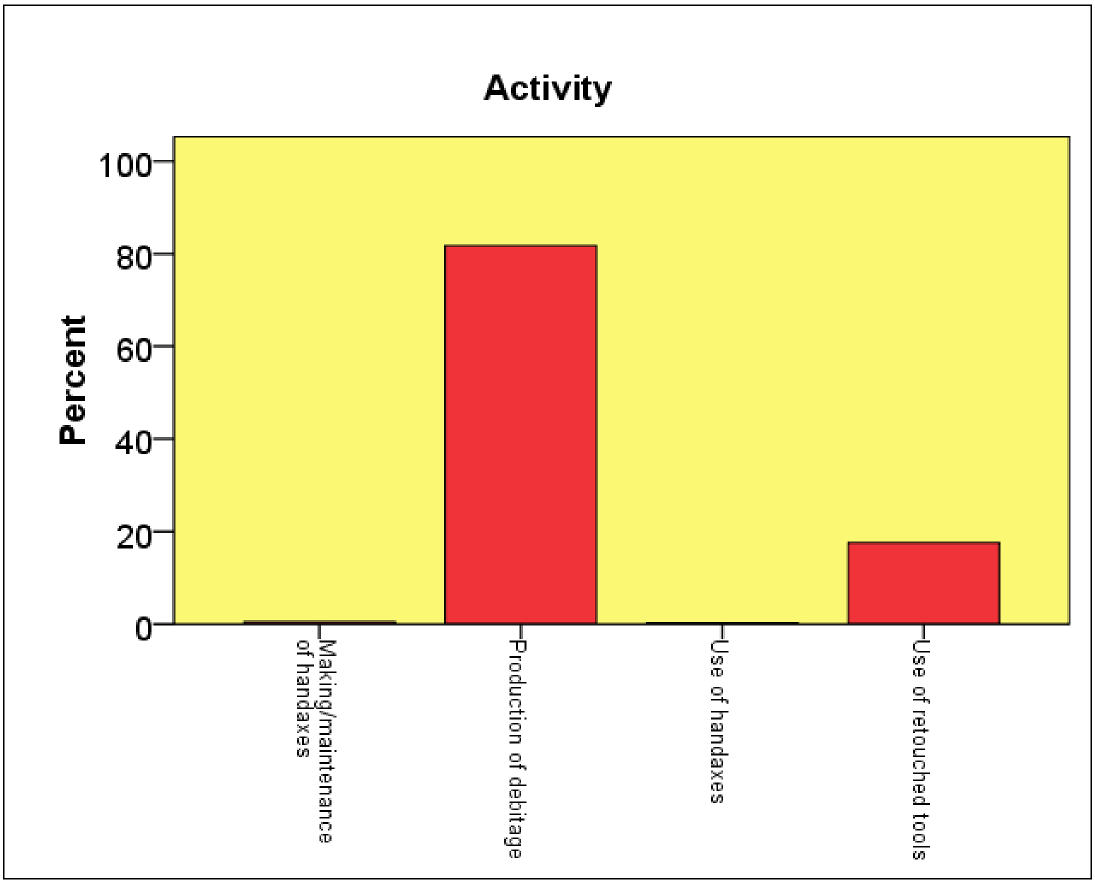

Figure 75: Activities performed at layer H, Le Moustier.

This pattern, if seen in the context of the typology proposed in this thesis, can be interpreted as follows. The fact that Neanderthal occupation in layer H has been shown to be correlated with hearths, where animal bones have been burnt indicates its possible association with type c), namely the food consumption/resources processing sites. These are the sites where meat would have been carried after a hunt. This interpretation is corroborated by the activity focus, as inferred by lithics. The emphasis in the production of debitage could have been associated with light duty butchery which is expected to occur in these sites. In this context we can also understand the reduced number of handaxes, which, as mentioned above in the case of layer G, could also have been used in materials other than meat. A focus on light duty butchery is also supported by the fact that the most common tool type is the backed knife. Denticulates/notches and scrapers would have been related with the processing of resources (wood, hides) related to either short-term needs or future expeditions. Again the absence of mammoth in this sheltered site brings up the point of which parts of this animal would have been transported and if bones would have been excluded.

In layer G, I mentioned the possibility that the area surrounding Le Moustier and animal movements could have been observed from the hill slope above the site. Of course this is also possible for the occupation in layer H. In this sense the occupation of this layer would have incorporated aspects of the site type a), the rest/recreation/observation sites. In this context, information about Neanderthals' pastimes during the period this layer was occupied we get both from the large quantities of knapping debitage, and the types of retouched tools, but also from the presence of pieces of utilised iron oxide that Preyrony (1930) has recorded in this layer.

A question that arises in both the occupations of layer G and layer H of Le Moustier is where the actual kill/butchery sites would have been. The localised character of the occupations as seen from the use of raw materials indicates that these sites would have probably been located a few kilometres around the site. Open-air sites from this period have not been identified in the vicinity of the site yet and this would be a very intriguing focus for future research.

Finally, in relation to the climatic episodes in which the occupation of layer H occurred, the following observations can be made. According to Laville and Rigaud (1973) the sequence in layer H contains two climatic episodes, one cold and humid and one cold and drier period. The TL dates (Valladas *et al.,* 1987) place layer H between 46.3 +/-3 and 42.5 +/- 2 kyr ago. Figure 76 shows the climatic variability in this period. A succession of two cold episodes, the second characterised by harsher conditions can be identified between c.46 and 43.5 kyr ago. These though are preceded and followed in the graph by warm episodes not identified in the layer H sediment. This could mean that the margins provided by the TL dates are too wide. If layer H really corresponds with the episode identified in this graph it cannot have formed in more than 2000 years. Given that layer H overlies G and has to be younger, this interpretation would be in accordance with the earliest dating for layer G (between c. 55 and 50 kyr ago), based on TL dates but not with the later dating (between c. 51 and 42 kyr ago) based on ESR.

The ESR dates for layer H (Mellars and Grün, 1991) on the other hand, with the Linear Uptake Model, give a range between 44.6 and 36.9 kyr ago and with the

Early Uptake Model a range between c. 42.4 and 36.2 kyr ago. Figure 77 presents the climatic variability between 44.6 and 36.2 kyr ago, the widest margins provided by the ESR dates. There are four episodes of climatic deterioration with clear progression from a cold to an even colder climate and layer H could correspond to any of them. None of these lasts longer than 2,000 years.

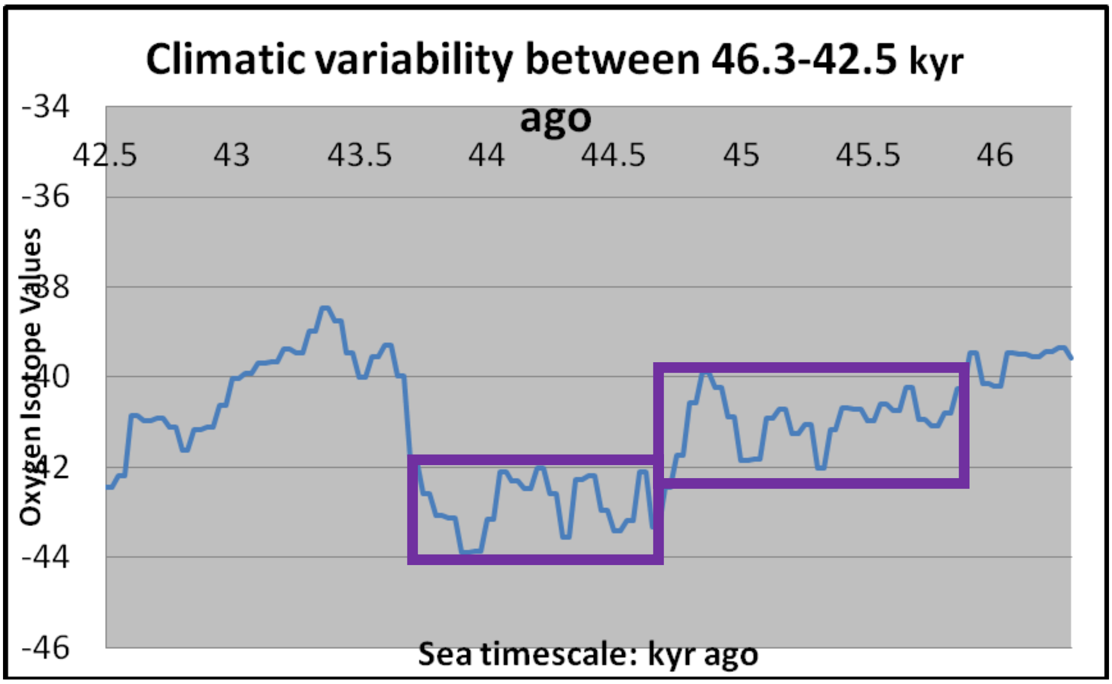

Figure 76: Climatic variability between 46.3 and 42.5 kyr ago. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

To sum up, we could say that it is impossible to place layer H in a specific cold episode as these are identified on the NGRIP climatic curve. This is due to the discrepancies between the TL and the ESR dates as well as the generally wide margins provided by the two techniques. One significant observation can be made on the amount of time that this layer covers. Contrary to Mellars and Grün proposing that it formed in a period of 5 to 6 kyr, according to the data examined here it seems more likely that it formed in a shorter period of about 2,000 years.

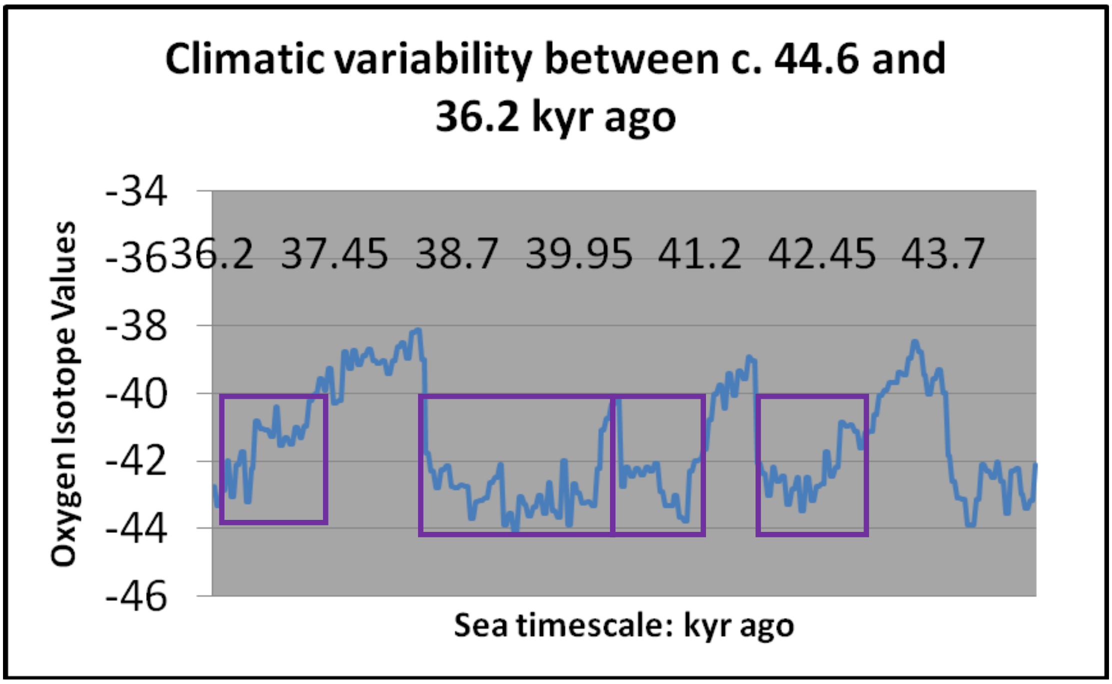

Figure 77: Climatic variability between c. 44.6 and 36.2 kyr ago. Data from NGRIP, available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

5.4. Combe-Capelle Bas

Combe Capelle comprises four sites on a limestone cliff in the valley of the Couze, a tributary of the Dordogne. The Roc de Combe Capelle and Abri Peyrony are located at the top of the slope at the foot of the limestone cliff. Above them is the site of Plateau Ruffet, while below them at the foot of the slope is the site of Combe Capelle- Bas (Dibble and Lenoir, 1995a). The latter is the main focus of this section.

Extensive excavations in Combe-Capelle Bas started from the end of the 19th century. More important though are considered the ones conducted by Henri-Marc Ami in the period between the late 1920's and his death in 1931. The collections of the site were studied consecutively by Denis Peyrony and Maurice Bourgon, and the site was widely used in the interpretations of Middle Palaeolithic by Abbé Breuil, Peyrony and Bordes in the middle of the 20th century. In 1987 a new excavation programme began under the direction of Harold Dibble and Michel Lenoir, with the purpose to clarify issues of the geology, stratigraphy, chronology and the industrial sequence of the site. The programme following up from initial mappings and surveys ended in 1991, and resulted in the publication of a volume in 1995 (Dibble and Lenoir, 1995b). It is on the results of this most recent excavation and study programme that the interpretations in this section are mainly based.

The stratigraphy revealed by Ami can be seen in figure 78. Levels Va-Vc were distinguished on sedimentological grounds, as was level I. The intermediate levels IV-II were defined by Ami as arbitrary excavation units (Dibble and Lenoir, 1995a). The most recent excavation aimed to sample the layers that were identified by Ami and was undertaken in three sectors (Dibble et al., 1995) (Figure 78). The stratigraphy of sector I (Roth et al., 1995) which has yielded TL dates, attributable to MIS 3 (Valladas et al., 2003) is presented here. The artefacts found in this sector occur in two types of context:

a) In slope deposits that were later incorporated in the river Couze.
b) In bank deposits that collapsed and were also incorporated in the river.

In this sense, two types of occupation are anticipated, one on the slope, a bit further away from the river banks and one directly on the river banks. The stratigraphy is the following:

a) Level I-1A: Brown soil, rich in lithic artefacts. This layer is probably the result of mixing by roots and burrowing animals.
b) Level I-1B: Pale yellow sediment, composed of calcareous sands with small stones. Several large blocks were found in this layer. It contained one of the largest lithic samples in sector I.
c) Level I-1C: This layer is the result of two channels cutting in the underlying level I-1D. It contained similar sediment to the overlying layer I-1B, but had a loose stone matrix with many stones averaging about 2 cm in diameter. It contained lithics with apparent post-depositional damage.

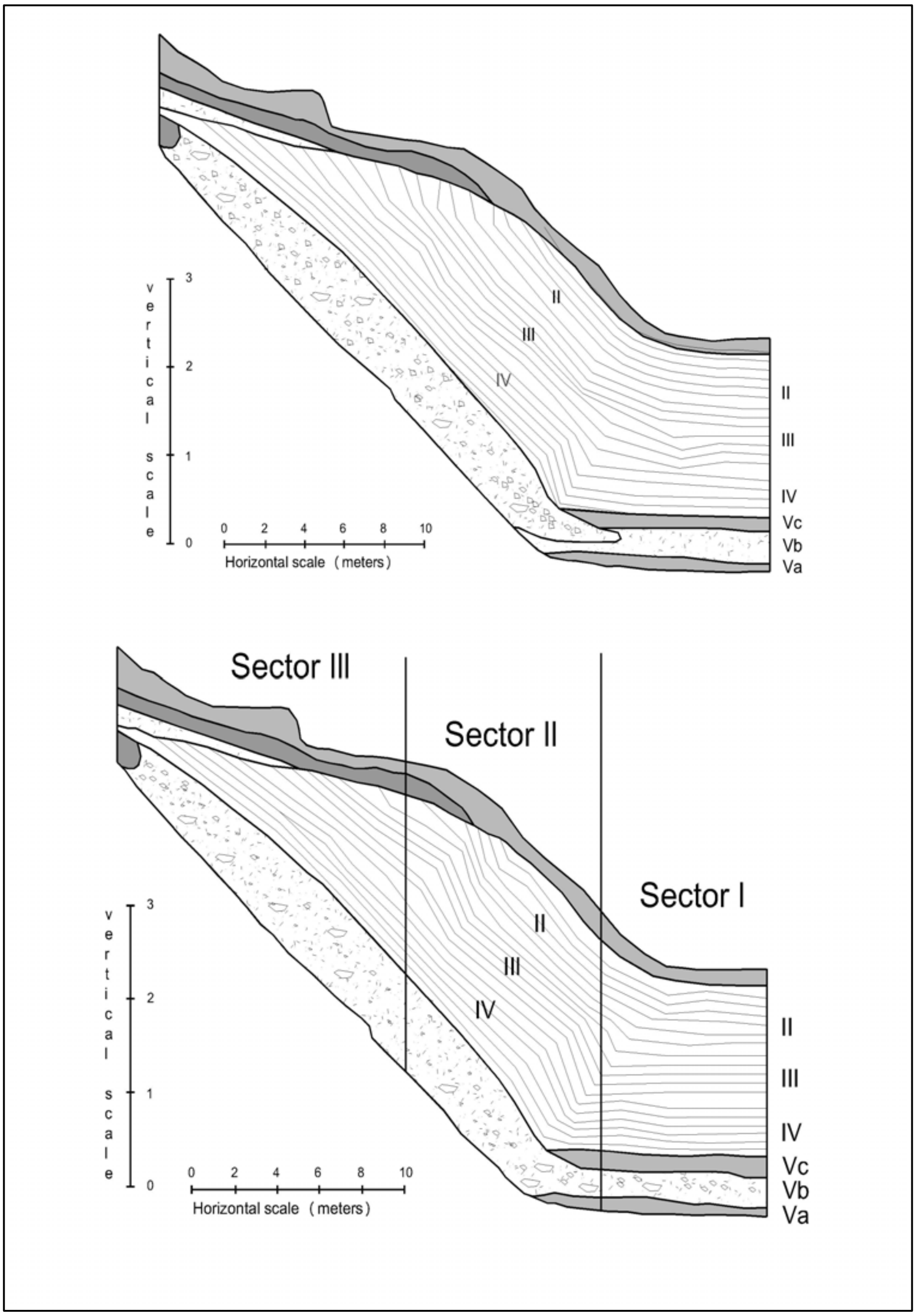

Figure 78: The stratigraphy revealed by Ami (on top), divided in sectors in the recent excavations (Bottom) (Dibble and Lenoir, 1995). Redrawn by Aggeliki Zacharia.

d) Level I-1D: This layer is differentiated by I-1B, because of its less compacted sediments and the large limestone blocks it contains. It included the largest lithic collection of sector I.

e) Level I-1E: This layer is a transition between beds I-1 and I-2. It was distinguished from its overlying layer by a higher concentration of small stones, although it had the same colour. It also contained a large artefact assemblage.

f) Bed I-2, including levels I-2A and I-2B: This is composed of fine brown-yellow sand that surrounds blocks of Maestrichtian and Campanian limestone and occasional flint nodules. It also contains lithic artefacts.

g) Level I-3: Brown-yellow calcareous gravels in sandy clay with sub-horizontal or oblique bedding.

h) Level I-4: Quartzitic sands, red yellow in colour, sorted with sub-horizontal bedding. Levels I-3 and I-4 were only excavated in very small areas, where a few artefacts were recovered.

The absolute TL dates taken from burnt flint samples in these levels are shown in Table 27. Sample CC2 seems to be in discordance with the rest and is thought by Valladas *et al.* (*ibid*) to be the result of vertical movement of artefacts. If we ignore this sample, we can place the occupation between layers I-1D and I-2B to have occurred in the period between c. 57.4 and 48.2 kyr ago. The archaeology of the 3 layers that produced the absolute dates and layer I-2A, which is in between them, is going to be presented below.

Sample	**Layer**	**Age (kyr ago)**
CC10	I-1D	57.4 +/- 4.2
CC9	I-1D	55.6 +/- 4.4
CC2	I-1D	36.6 +/- 2.7
CC6	I-1D	48.2 +/- 3.3
CC7	I-1D	48.9 +/- 3.8
CC8	I-1E	56.9 +/- 7.8
CC3	I-2B	52.9 +/- 4.6

Table 27: TL dates in sector I (Valladas et al., 2003).

5.4.1. The layer I-1D

According to the studies of bed I-1 (Bertran and Texier, 1995), the sediments in this bed show sorting and bedding, indicating fluvial action. There is evidence that the sediments were subjected to rapidly changing hydrodynamic conditions, including high energy flows, followed by low energy flows. This is interpreted as the possible result of:

a) Arid or semi-arid conditions.
b) Light vegetation cover.
c) A steep stream gradient.
d) An impermeable surface, due to permafrost.

Except from the presence of permafrost that cannot be demonstrated, the other factors seem to have been operating together. They all point to the I-1 bed being formed, during a cold period, as a result of fluvial action. The accumulation of sediments by river action though is not the sole agent for the creation of the layers in bed I-1. Bernard and Texier (*ibid*) suggest a re-working of slope sediments by the river. It seems that at the time these layers were formed the river Couze flowed at a much higher level than it does today, adjacent to the slope, where the archaeology is found. Sediments from the slope that contained the archaeology were constantly re-worked by the river in the deposits we find today. These slope deposits seem to have soliflucted downslope, towards the river bed.

In general this is how the sediments in all three sectors were formed, with only a few exceptions. According to the magnetic and electrical resistivity studies (Ellwood, 1995) a set of terraces already existed on the slope and the soliflucting sediments came to a rest on them creating the current stratigraphy. According to this scheme the sediments at the lowest part of the trench in Combe-Cappelle Bas have to be the youngest. This is sector I that is examined here.

Furthermore on bed I-1, the taphonomic study (Kluskens, 1995) showed that there are no indications for mixing of the artefacts, due to the movement of the sediments. It is more likely that the artefacts were first deposited and then the sediments moved as a package, re-depositing the original composition of artefacts they contained. Dibble reaches the same conclusion in his assessment of the integrity of the assemblages in Combe-Capelle Bas and proposes a minimal movement of the sediments from an area not too far upslope (Dibble, 1995).

Layer I-1D contained 1652 artefacts. It contains both worn and unworn artefacts, indicating a palimpsest. The great majority of the artefacts (92.5%) are made on Campanian flint that outcrops at the immediate environment of the site. The rest are divided in categories, spanning a great range. More than half of the artefacts that have not been made on strictly local materials are of unknown origins (Roth, *et al.*, 1995). The rest includes flint possibly picked up from the Couze that would have been adjacent or near adjacent to the site, and other flints, jasper and quartzite that originate from 3-15 km from the site (Turq, 1995). Finally, there are a few artefacts on flint that occurs in primary position in the Bergerac region, about 30km away. Of the identified non-local materials 46 artefacts come from the range up to 15 km, with most of them originating much closer than that and only 8 pieces are related with flint from the area of Bergerac. Like in the case of La Ferrassie and Le Moustier, the presence of flint from Bergerac might indicate some type of rare contact with Neanderthal groups in the area of Bergerac.

The description of the artefacts provided in Table 28 is based on the data published by Roth *et al.* (*ibid*). According to the authors (*ibid*), there is evidence for use of Levallois, discoidal and blade making techniques. Also there is evidence for *in situ* retouching of flakes and bifaces. No specific numbers are given for the evidence on these different techniques except for the Levallois technique. For this reason we cannot perform the analysis we applied in other layers of the frequency of different activities, occurring at the site. What is immediately clear from the available data though is a significant emphasis on the production of debitage at the site.

In terms of tools identified in the layer, notches and denticulates are by far the most common type of tools followed by scrapers. Burins, piercers and truncations are only rare and handaxes are absent. Of some interest is the presence of cores on flakes, or flaked flakes. This strategy of using flakes to produce other flakes could have been related to the exhaustive use of good quality materials that were rarer. One such example is a core on flake made on Bergerac flint.

Artefact type	Frequency
Levallois debitage	23
Scrapers	90
Burins	4
Piercer	1
Handaxe making debitage	3
Notch	85
Denticulate	41
Truncation	3
Other retouched pieces	5
Cores on flakes	3
Cores and core fragments	98
Debitage	1296
Total	**1652**

Table 28: Artefacts' frequency in layer I-1D in Combe-Capelle Bas.

A pattern observed in the non-local materials is that non-cortical flakes occur in great percentages, indicating that the initial reduction took place away from the site. Also flake fragments and shatter, associated with these initial stages of reduction are less common in the non local materials. Finally, the cores identified in non-local materials are usually smaller than the cores related with the local ones (Dibble, *et al.*, 1995).

In terms of the typology proposed in chapter 2 of this thesis the following can be suggested. At first glance, the fact that we are dealing with an open- air site, which would have been so close to a water source, brings to mind the possibility that this could have been a butchery/kill site. Such an interpretation though would entail the presence of a bone assemblage, indicating butchery activities. On the contrary only two animal bones have been recovered from this layer and there is no indication that these were related to hominid activity. Of course we should take into account the fact that the sediments, containing the archaeology have been re-worked to a certain extent by river action. Invoking of a sorting factor would not explain why in the lithic assemblage we find the whole range of artefacts of all possible dimensions, while a whole bone assemblage has disappeared. Of course, there is always the possibility that these sediments were not suitable for the preservation of bones, but there is no specific study, related for example to the acidity in the layer, that would undoubtedly point to that direction. Based on the existing evidence an attribution of this site to the butchery/kill site category is not tenable. This is also supported by the complete absence of handaxes that we would expect to find at a site, where primary, heavy duty butchery would have occurred.

At the same time, the fact that we are dealing with an open-air, hence unprotected site, the absence of bones that would have occurred as a result of Neanderthals carrying meat there and the absence of fire in the form of hearths, which indicates a longer duration of occupation, renders the attribution of this site to the category of food consumption/resources processing sites untenable. Of course the fact that absolute dates have been taken on burnt flint, indicates the presence of fire at the site at specific points. It is impossible though to differentiate this evidence that could have possibly occurred as a result of natural fire from fire that would have been used by hominids for protection from the cold and other animals. The possibility that hearths existed and were destroyed by site formation processes is likely, given that this layer was subject to solifluction. In any case, if evidence for fire existed, I would expect that fire was not lit as often, or for as long periods, as in the sheltered sites.

This leaves us with the final possibility that this was a rest/recreation/observation site. Its location on a slope overlooking a river valley, possibly a bit higher than we find it today, is consistent with such an interpretation. It is possible that herbivores would have followed the course of this river valley for their movements and the slope of Combe-Capelle Bas would have provided a good resting point for Neanderthals, at the same time keeping them in touch with their prey, while they would plan their next hunt.

The archaeology of the site is consistent with such an interpretation. The production of debitage seems to have been by far the most important activity at the site and this can be understood as a pastime activity that had the double purpose of preparing gear for the hunt and bonding the hunting group together. Notches and denticulates that could have been associated with woodwork and more specifically with the preparation of spears are the most common tool types. Also present are burins that could have been related with woodwork. Other not so common activities, possibly related with hide processing are also indicated by other tool types, like scrapers and the piercer. Handaxes were either made or repaired at the site possibly with the purpose to be transported and used at butchery/kill sites.

Assigning the layer I-1D of Combe-Capelle Bas to the category of rest/recreation/observation sites raises questions on where the sites of the other categories could have been. In other words, where were the tools manufactured at Combe-Capelle Bas used to kill and butcher herbivores? Also, where were the protected sites, where the meat of these herbivores would be transported and consumed by Neanderthals?

In an attempt to identify possible such sites, we can start with the sites in the immediate vicinity of Combe-Capelle Bas, which are the rest of the sites of the Combe-Capelle complex. The first is the site of the Plateau du Ruffet. This site which contained a lithic assemblage attributed to the Mousterian of Acheulean Tradition is undated and hence no correlations can be easily made. In any case, as an open air site, found in high elevation, it would most likely play the same role as the occupation described in layer I-1D of Combe-Capelle Bas, meaning that it would probably be a rest/recreation/observation site. In this sense even if it proved to be contemporary with Combe-Capelle Bas it would not help us find its complementary sites. There are two more sites above Combe-Capelle Bas. The first is the Roc de Combe-Capelle, which has not yielded any Mousterian occupation and hence is not relevant to the question posed here. The other is Haut de Combe-Capelle or Abri Peyrony. This has yielded an undated assemblage, attributed to the Mousterian of Acheulean Tradition. As a sheltered site, it could be the site where Neanderthals of Combe-Capelle Bas would retreat after a successful hunt. This site has revealed a bone assemblage, including herbivores, and this could support such an attribution. There are a series of problems though, with such an interpretation. There is no recorded evidence for fire use at this site, and the fact that it has been excavated a long time ago does not help to clarify this problem. Also there is no formal study indicating that the bones found at the site were the outcome of hominids' activities. Finally, the most important factor is the lack of dating for this site, which renders any correlations risky.

Other sites that could be correlated with the occupation at Combe-Capelle Bas are found within a distance of 15 km, which is the limit for transportation of non local materials, coming from a medium distance. Such sites are Tombeboeuf, Moulin-du-Millieu and La Plane.

La Plane is an open-air site on a plateau, which dates before the period we are interested in and more specifically between the end of MIS 5 and the beginning of MIS 4 (Turq, 2000). Tombeboeuf is also an open-air site, which contains only one archaeological layer with lithics in a secondary position. Evidence regarding its chronology is completely lacking.

Finally, the cave of Moulin du Millieu, situated on the right bank of the river Léde could be a sheltered site of the type we are looking for. It was excavated in the late 19th century and in more recent times. Faunal elements have been uncovered in its sediments, including reindeer, horse and mammoth. These were found alongside a succession of Quina on top of Mousterian of Acheulean tradition lithic industries. This site has also yielded Neanderthal fossil remains. The first excavations at the site in 1866 by M. Cassaignes had revealed evidence for ashes at a level that could be correlated today with Neanderthal occupation.

The presence of fire at this site would reinforce the idea that this could be one of the places, where Neanderthals of the Combe-Capelle Bas range would carry and perhaps stash meat and where they would spend longer periods of time. Unfortunately, at the moment no detailed information exists about the raw materials used in Moulin du Millieu.

The basic problem with this site though, is that absolute dating is lacking. Turq (*ibid*) has proposed a date for the upper layers in the pleniglacial, possibly MIS 4. This attribution would be consistent with Mellars' (1996) argument that Quina assemblages cluster in MIS 4, in South-Western France. In such a case this site would be irrelevant for our study. Until its chronology is clarified though the possibility remains that it could have been in some way related to the occupation of Combe-Capelle Bas.

5.4.3. The layer I-1E

The same site formation processes that operated in layer I-1D also operated in this layer. Again, in this case, the sediments seem to have soliflucted a small distance down the slope and they were re-worked by the river. As in the case of layer I-1D, the lithic assemblages can be generally considered to have moved as a package with the sediment without changing their original composition. This layer seems likely to have formed also in conditions, related to aridity, cold climate and in general sparse vegetation.

This level contained 1231 artefacts. These were in different stages of wear indicating a palimpsest. The greatest percentage of the artefacts (91%) was made on Campanian flint, outcropping in the immediate vicinity of the site. The rest, at least the ones that could be identified to their source are again divided between the ones made on raw materials occurring at a medium distance from the site (3-15km) and a few made on flint from Bergerac. For the mode of transport of the latter material we can only hypothesise.

The assemblage contains evidence for the use of both the Levallois and discoidal techniques, while it is not clear if any blade production occurred. The number of cores, the amount of cortex found on most of the artefacts, and the presence of knapping debris indicate primary knapping at least for the strictly local material. For the other materials it is more usual that artefacts are transported in a finished or nearly finished form.

Table 29 contains a description of the artefacts in this assemblage, based on the data in Roth *et al.* (1995).

The range of variation in this assemblage is not much different from the one found in layer I-1D. Again here we have an emphasis on the production of debitage and a range of retouched tools that go with it. Scrapers on one hand and notches and denticulates on the other remain in both layers the most common tool types

Artefact	Frequency
Levallois debitage	10
Debitage	940
Scrapers	82
Burin	2
Piercer	2
Backed knife	1
Truncation	3
Notch	46
Denticulate	26
Other retouched pieces	18
Chopping tool	1
Cores on flakes	11
Cores and core fragments	89
Total	**1231**

Table 29: Artefacts's frequencies in layer I-1E.

The main difference between the two assemblages is that Layer I-1E does not preserve any evidence for the manufacture or retouch of handaxes and neither for the retouching of flake tools on the spot. In the case of the lack of evidence for the *in situ* retouching of tools we could say the following. The fact that there are indications that the greatest part of the assemblage seems to be a result of primary knapping at the site and the fact that the blanks produced by this primary knapping have been also used to make tools, points to the possibility that this lack of evidence does not necessarily represent a true behavioural pattern. In any case, even in the assemblages with evidence for the *in situ* retouching of tools we don't get to recover all the retouch spalls from every artefact ever retouched on site. On the contrary , in the case of handaxes the fact that flakes related with their manufacture and their retouch, as well as handaxes themselves are lacking from the assemblage possibly point to a true behavioural pattern and we have to assume that handaxes were manufactured somewhere else in the landscape. Whether this pattern can be associated with the production of handaxes at the Abri Peyrony, higher up the hill slope, or with the handaxes found in different loci to the east of the Combe-

Capelle Bas cannot be resolved due to the present lack of dating evidence for these occupations.

In terms of the attribution of this layer to one of the categories of the site typology proposed in chapter 2 of this thesis, the following can be said. As in the case of layer I-1D, the fact that we are dealing with an open air site on a hill slope, overlooking a river valley, points to the attribution of this site to the rest/recreation/observation sites category. This is corroborated by the absence of fire that would be associated with a longer duration occupation and the complete absence of bones that are usually related with butchery/kill sites. Again in this case the emphasis on the production of debitage can be associated both with the preparation of hunting gear and also seen as a pastime activity collectively performed by the hunting group. At the same time activities related to the working of wood, possibly for the manufacture of spears and the processing of hides would have taken place at the site, as shown by the presence of notches and denticulates and burins on one hand and scrapers and piercers on the other. The association of this occupation with contemporary sites of the other categories of the site typology used in this thesis will have to remain tentative, due to the problems with dating of sites in the surrounding area as has been explained in more detail in the previous section.

5.4.4. The layer I-2A

This is also a layer that resulted from the incorporation of bank deposits with the river bed. Contrary to the above layers, it seems that these sediments were deposited in a position immediately adjacent to the river bank and were possibly incorporated in it as a result of the collapse of this bank (Bertran and Texier, 1995). There is no indication that this layer formed in different climatic conditions compared with the two layers that overly it and were described above.

The lithic assemblage includes 962 artefacts. These exhibit various stages of wear, indicating a palimpsest. The artefacts are made on a range of raw materials with their greater percentage (92.7%) made on the Campanian flint outcropping in the vicinity of the site. Other materials include flint picked up in a cobble or pebble form from the Couze, as well as quartzite and other types of flint occurring between 3 and 15 km away from the site. There are also a few artefacts on Bergerac flint.

In terms of the techniques used in this assemblage, there are indications for the use of both the Levallois and blade making techniques, although in most of the cases the artefacts do not seem to have been by a recognisably patterned technique. This holds true, in the case of the cores as well, which are unpatterned in most of the cases. There is an emphasis on the production of thick blanks that could be related to the application of the Quina or salami-slice technique (Debenath and Dibble, 1994). As in the layers described above, there seems to be a clear trend for primary knapping and reduction of cores, as shown both by the large number of cores and the number of artefacts that retain some quantity of cortex on their dorsal. Like in layer I-1E the absence of artefacts associated with the manufacture and retouching of handaxes, combined with the absence of handaxes themselves is taken to mean that these artefacts were not part of the reduction sequence in this assemblage and were possibly manufactured in other places in the landscape, if at all. On the other hand, retouching of artefacts could have happenned *in situ*. Although retouch spalls are missing, evidence for *in situ* retouch is provided by the rest of the sequence.

The description of the artefacts in table 30 is based on the data provided by Roth, *et al.*, (1995).

Artefact	**Frequency**
Levallois debitage	13
Debitage	672
Scrapers/end scrapers	73
Burins	2
Piercers	2
Backed knife	1
Truncation	1
Notches	46
Denticulates	26
Cores on flakes	6
Cores and core fragments	111
Other retouched pieces	9
Total	**962**

Table 30: Artefacts' frequencies in layer I-2A.

In general, the view from the assemblage of this layer is not much different from the two layers discussed above. Again the emphasis is on the production of debitage and the most common tool types remain the scrapers on one hand and the notches and denticulates on the other. Other types like backed knives, burins and piercers occur in small numbers.

In terms of attributing this site to one of the categories of the site typology used in this thesis we could say the following. As in the case of the previous two layers, we are dealing with an open-air site near a water source, although in this case the occupation seems to have taken place in immediate contact with the water. The presence of only two bones in the assemblage does not support any correlation of this site with the kill/butchery site category. On the other hand, the absence of definitive evidence for consistent use of fire and the unprotected nature of the site render its attribution to the food consumption/resources processing sites category improbable. Given that this layer was not subject to solifluction, there would be more possibilities for evidence of fire to survive, if it was there originally. The most likely attribution for this site would be the rest/recreation/observation site category. This attribution is corroborated by the emphasis on the production of debitage, which has already in the other layers considered to be related to pastime communal activities. Again notches, denticulates and burins could have probably been used for wood work, possibly related with the construction of wooden spears, while scrapers and piercers might have been associated with the processing of hides.

A question that can be raised at this stage is related to the degree of the opportunity for observation given by a site that is basically situated at the bottom of a river valley. I believe that there are two main ways to go about this. One would be to incorporate this site into the rest/recreation/observation sites category, keeping in mind that the degree of observation would have been hindered if compared to sites situated in higher elevations. The other would be to see this as a new type of site, where resting and recreation in the immediate presence of a water source took precedence over the actual possibilities for observation.

In the end, I think that it would be more appropriate to keep these two variations in the same type of site with their difference being in emphasising different aspects. This is better understood, if we think that the observation of the surroundings would have been an embedded and constant element of Neanderthal lives, as they went about their landscapes. The fact that some places in the landscape offered greater opportunities for observing larger areas does not mean that the observation would stop at a site that did not have a commanding view. At the same time, other factors could have defined the opportunities for visibility. The fact that the occupations in Combe-Capelle Bas seem to occur in periods when the vegetation was sparse might have made the observation of the surroundings possible even from lower elevation points. In terms of the resting aspect, spending time near a water source -and this relates to all levels of occupation in Combe-Capelle Bas- would have constituted an obvious advantage. It is easier to rest, when you satisfy your need for water. The fact though that the rest/recreation/observation sites that were identified in Britain are located on high hills and not with an immediate contact with water does not completely take away the resting aspect from them. It is more a difference in degree as seen in variations of a theme that we are discussing here and not two completely different instances of Neanderthal lifestyle.

5.4.5. The layer I-2B

This is the final and oldest layer in sector I of Combe-Capelle Bas that will be discussed here. The site formation processes of this layer are similar to the ones for layer I-2A. Bank deposits were later incorporated in the river and reworked by river action.

Its lithic assemblage consists of 527 artefacts and is the smallest of the assemblages discussed from this site. The artefacts are in different stages of wear, indicating a palimpsest. Most of the artefacts have been made on the raw material, outcropping at the site (94.22%). The rest were made on more or less the same range of raw materials, observed for the other layers of Combe-Capelle Bas, with most of them coming from 3-15 km away and only a few pieces made on Bergerac flint.

There is some evidence for the use of the Levallois technique in this assemblage, as well as the production of thick blanks related to the application of the Quina technique. The emphasis remains on primary knapping on the site, as shown by the quantity of the cores in the assemblage, the high numbers of cortical flakes and the use of large blanks for the making of tools. Handaxes and flakes related to their making are once more absent.

The description of artefacts in table 31 is based on the data in Roth *et al.,* (1995).

Artefact	**Frequency**
Debitage	348
Levallois debitage	2
Scrapers	32
Burin	1
Notches	24
Denticulates	23
Other retouched pieces	10
Chopping tool	1
Cores and core fragments	83
Truncation	3
Total	**527**

Table 31: Artefacts's frequency in layer I-2B in Combe-Capelle Bas.

In general, no significant differences are observed between this assemblage and the other three, discussed above. Again there is an emphasis on the production of debitage and the most common tools in the assemblage are scrapers on the one hand and notches and denticulates on the other. The occupation is found in the same environmental conditions as the one in layer I-2A and there is no significant change that would point to this being a different type of occupation. Possibly the most significant difference between these two layers is the presence in layer I-2B of 17 animal bones. The authors of the publication do not provide any description of these bones and there are no implications made of these bones being possibly related to the human occupation. In any case, this is a very small bone assemblage and it will not be considered as a factor affecting the interpretation of this layer. In this sense, the occupation of layer I-2B should also be classified in the rest/recreation/observation sites category. The observations regarding the variations within this category made for layer I-2A (see above) are valid for layer I-2B as well.

Thinking of all four occupations in Combe-Capelle Bas that were examined here, we could say that there is no significant change in the type of ocucupation occurring. All four layers seem to belong to the same category of the rest/recreation/observation sites. The only difference that can be observed in the younger layers (I-1E and I-1D) is a tendency to move higher up the slope, possibly in a search for a more commanding view of the valley, while at the same time keeping in a close distance to the very much needed water source.

Finally, in terms of the climatic episodes, in which the four occupations in Combe-Capelle Bas seem to have occurred, the following observations can be made. In all cases the existing evidence points to occupations taking place during cold and dry periods when the vegetation would have been sparse. This means that the occupations in Combe-Capelle Bas could have taken place in one or more cold episodes, within MIS 3. If we discard the very young age of sample CC2 (see above table 26), which is probably the result of post-depositional vertical movement of artefacts (Valladas, *et al.*, 2003) the occupation in these layers is placed between c.57.4 +/- 4.2 kyr ago and 48.2 +/- 3.3 kyr ago. If the margins of error for these dates are also taken into account the occupations in Combe-Capelle Bas can be placed anywhere between 61.6 and 44.9 kyr ago.

Figure 79 gives an idea of the climatic variability, within this period. Following the definition of cold episodes in MIS 3, used in this thesis, we can see that most of this period, with only a few exceptions, was dominated by such cold conditions. The occupation at the three layers of Combe-Capelle Bas could have occurred at any time within this period, when the climatic curve indicates cold conditions. The large error margins of the dates make it impossible to tie with certainty the occupations in Combe-Capelle Bas with specific cold episodes. This happens because in any given period defined by these margins, usually both warm and cold episodes occur. In the face of this, I have tried, for the sake of the argument, to match the mean dates of the samples as these were given in Table 26 to the climatic curve (the position of the means of the dates, indicated by yellow stars) and see if these correspond to cold climatic periods. Interestingly all, except one, fall in the heart of a very cold episode.

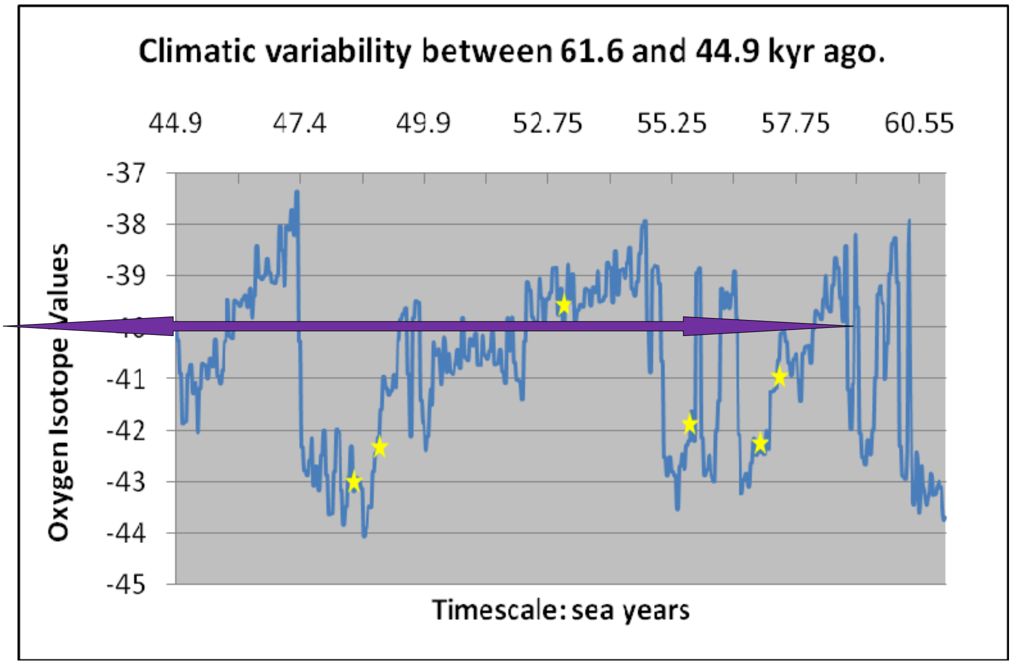

Figure 79: Graph showing the climatic variability between 61.6 and 44.9 kyr ago. The purple arrow indicates the cut-off point, below which the conditions are considered in this thesis to indicate cold episodes in MIS 3. The yellow stars indicate the position on the curve of the means of the absolute dates taken in the different layers. Based on data from NGRIP. Available at http://www.glaciology.gfy.ku.dk/ngrip/index_eng.htm

5.5. A discussion of the data and their interpretation.

In this chapter I have presented the available data from different layers in three of the key MIS 3 sites in South-Western France. Now, it is time to attempt to bring all these data together and see what they can tell us in terms of the research questions posed in this thesis and in relation to the explanatory model proposed in chapter 2.

In the first part of the model outlined in chapter 2, in relation to the climatic data, an explanatory hypothesis was put forward regarding the richness of the Palaeolithic record in South-Western France, during the Last Glaciation in general and the MIS 3 in particular. It was suggested that Neanderthals occupied this area of France both in the warm and humid as well as in the cold and dry episodes, during this period. This would entail a denser population, during the coldest periods, due to the inferred contraction of Neanderthal populations towards the south. It would remain for such an assertion to be supported or rejected, based on the archaeological data from the specific area.

The data from the layers of the three sites examined in this chapter seem to support such an association. Most of the time, the occupations seem to have occurred within very cold and dry episodes (Layers M2e, M2c from La Ferrassie, layers I-1D, I-1E, I-2A, I-2B from Combe-Capelle Bas, Layer H from Le Moustier). Especially in the cases of the layers from La Ferrassie and Combe-Capelle Bas, where the archaeology is more clearly attributed to distinct stratigraphic units, it becomes obvious that these occupations were dense enough to produce rich archaeological layers. On the other hand, in the case of layers G and H in Le Moustier and their subdivisions we get an insight into a whole climatic sequence, through which Neanderthal occupations occur. We have the cold and relatively humid climate of layer G1 changing into the climatic amelioration of G2, and reversing back to colder conditions in G3 and G4, with continuous Neanderthal occupations spanning this period. Consecutively, we have the really harsh climatic conditions prevailing throughout layer H, where the very cold and very dry climate is related to a denser Neanderthal occupation. There is no doubt that there is good evidence, on the basis of these 3 sites that were examined, to support the climatic model proposed in chapter 2, and more specifically the hypothesis related to South-Western France. As more detailed climatic, stratigraphic, environmental and dating evidence will become available from more sites in the future, it remains to be seen if this model will still hold and even become stronger, or will possibly have to be re-evaluated.

Moving on to the second part of the model outlined in chapter 2, which refers to the typology of Neanderthal sites and their inter-relations, the following can be said. A hope was expressed in previous chapters that in the case of the rich archaeological record of South-Western France, it would be possible to show likely associations of different types of sites, within the Neanderthal range. The reality proved to be different. Although the sites chosen to be examined in this chapter were always at a distance of less than 32 km from each other, which constitutes the range for a group of 25 Neanderthals, according to Steele’s estimations (1996), it was impossible to associate them.

This is mainly due to the fact that the hard evidence from raw materials pointed to the range of Neanderthals having a mainly local character. In the case of Combe-Capelle Bas, an extended range of 15 km was identified, based on the raw material provenance studies (Roth *et al.*, 1995), but it remained impossible to connect the occupation of this site with other penecontemporaneous sites. The significance of these results is twofold. First, it seems that, like in the areas of Britain and Belgium discussed earlier, we are dealing with small Neanderthal groups, with definitely fewer than 25 persons. This is based on the localised nature of the Palaeolithic occupation in all three areas. Small ranges are usually associated with smaller group size, according to the logic used in Steele's (1996) model. These groups could have possibly consisted of as few as 8 persons, which is the lower limit for a group of hunter-gatherers with no social division of labour, as proposed by Binford (2001). On the other hand, it brings up the question of where the actual sites associated with these occupations were. It is obvious that we should look for them closer to each of the sites already identified, but of course there is no certainty that the sites will be found. It is the nature of the Palaeolithic record that the evidence surviving does not necessarily give an accurate and holistic view of the past.

In any case, this should not be taken to mean that it is not worth looking for these sites in our constant effort to understand the Palaeolithic past. Also it does not take away the value of understanding the sites that we find as part of a Neanderthal range, even though most of the times we'll get to see only one aspect of this range in each occupation. If nothing else, such an approach protects us from resorting to explanations that extrapolate the aspects of one type of site to vast geographical and chronological periods and it does that by always bringing to mind that absence of evidence does not necessarily equal evidence of absence.

Table 32 provides us with a summary of the data for each of the layers discussed in this chapter, along with its proposed attribution to a specific type in relation to the typology proposed in chapter 2. As we can see, there is not a clear and distinct pattern for both of the types of sites that occur in South-Western France. While the food consumption/resources processing sites always occur in sheltered location at the bottom of valleys, the rest/recreation/observation sites occur in both open and sheltered locations and in different altitudes in the valley geography. At the same time, each of the two different types is associated with a variety of environmental and climatic conditions. Even in terms of the lithic assemblages there is no distinct assemblage associated with each of the two types, as handaxes can be linked to both. It seems that the safest ways to distinguish between the two types of sites in this area are the presence or absence of fire in the form of hearths and the presence or absence of a good quantity of bones that can be clearly shown to have been humanly modified.

Site/layer	**Location**	**Bones**	**Fire**	**Archaeology**	**Environment**	**Climate**	**Open/sheltered**	**Site type**
Ferrassie M2e	Valley bottom	A lot, burnt	Yes	Debitage +flake tools	Open	Cold-dry	Sheltered	Food consumption/resources processing
Ferrassie M2c	Valley bottom	A lot	No	Debitage +flake tools	Open	Cold-dry	Sheltered	Rest/recreation /observation
Moustier G	Valley bottom	A lot	No	Debitage +flake tools+handaxes	Open and closed	Cold-humid/ warm-humid	Sheltered	Rest/recreation /observation
Moustier H	Valley bottom	A lot, burnt	Yes	Debitage +flake tools+handaxes	Open and closed	Cold-dry	Sheltered	Food consumption/resources processing
Combe-Capelle Bas, I-1D	Slope, near water	Few	Not certain	Debitage +flake tools	Open	Cold-dry	Open	Rest/recreation /observation
Combe-Capelle Bas, I-1E	Slope, near water	Few	Not certain	Debitage +flake tools	Open	Cold-dry	Open	Rest/recreation /observation
Combe-Capelle Bas, I-2A	River bank	Few	No	Debitage +flake tools	Open	Cold	Open	Rest/recreation /observation

Combe-Capelle Bas, I-2B	River bank	Few	No	Debitage +flake tools	Open	Cold	Open	Rest/recreation /observation

Table 32: A summary of the data from the SW France sites.

At this point, it is important to refer to the observations made in relation to the significance of the different Mousterian variants. By just looking at these three sites, it has become immediately apparent that Mellars' (1996) argument about the Mousterian variants occurring in different chronological periods of the Last Glaciation can be questioned. The succession from Ferrassie to the Mousterian of Acheulean Tradition can be seen just happening in MIS 3, starting with the Ferrassie layers and then moving on to the MTA levels of Le Moustier. On the other hand such an assertion would rely a lot on our interpretations of the existing dates.

Indeed, the margins of these dates are wide and to a certain extent overlapping, leaving open the possibility that at least some of these sites could have been contemporaneous. This could mean that the synchronic perspective imposed on these assemblages by Bordes (1967) originally and followed by Binford (1969) may be closer to reality. It is this author's view that the truth lies somewhere in between. Of course the pattern identified by Mellars holds true for the specific sites he has used and this cannot be disputed. What can be questioned is whether such a pattern can be extrapolated to all the Late Middle Palaeolithic sites in South-Western France.

Another interesting pattern arising from the data examined in this chapter is the association of Neanderthals and hyaenas. Like in the cases of Britain and Belgium, examined in the previous chapters, the association of these two species seems to hold strong in all sites. Of course it is impossible with the current resolution of data to clarify with certainty, if they occupy the sites at the exact same time. Wherever the truth lies, the close existence of these two species in the landscapes of all the areas examined for the period of MIS 3 may be significant. The potential interpretations of such an association will be discussed in the following chapter, where the data from all areas will be brought together.

The final issue that will be discussed here is the absence of mammoth bone from the bone assemblage of Le Moustier. The climatic conditions prevailing at the time of occupation, as shown from the other animals present, would normally favour the presence of this big herbivore. We know that mammoth is not present in all sheltered sites of the Perigord. Unfortunately, it is not possible at this stage to clarify, if this is a result of Neanderthal hunting strategies, the eating preferences of another predator (hyaena), or completely random. In general, there is information for Neanderthals targeting different animals in different regions, for example reindeer in Salzgitter in Germany and steppe ass in Crimea (Burke, 2000). It seems that in the case of South-Western France it may be possible in the future to discern variability at a smaller scale, within a specific area.

In the next part of this thesis the data and the patterns observed in all three regions will be brought together and will be discussed, providing a step forward towards a holistic view of Neanderthal occupation in Western Europe during MIS 3.

CHAPTER 6: DISCUSSION AND CONCLUSIONS

6.1. Western European Neanderthals at the diachronic level: the climatic and environmental context of Neanderthal occupation.

In the first part of chapter 2, a model was proposed that was intended to provide the climatic and environmental context for the occupation of Western Europe by Neanderthals in MIS 3. According to that model Britain would be occupied during the warm intervals of MIS 3 and more specifically during the warmest peaks of these intervals. Belgium was to be occupied, during the same intervals, but also possibly during the periods of initial climatic deterioration that followed these intervals. Finally, South-Western France was seen as an area that could potentially be inhabited in all different climatic episodes of MIS 3.

Bringing together the data that was examined in the course of this thesis we can say that in the case of Britain the evidence on this subject is not very clear. There are definite indications for occupation of the area in at least one warm period. Evidence for this is provided by the climatic and environmental indicators in the archaeological assemblage of Lynford. Unfortunately, it is difficult to infer from this data exactly in which warm interval the occupation took place and if it was in its warmest peak. In the cases of the other sites examined, the available data does not give a definite answer. Some of the existing absolute dates for the British sites (Creswell Crags, Hyaena Den) could correlate with warm episodes; others though do not. The occupation of Hyaena Den in a sheltered wooded valley in the south-west of Britain could be an indication that Neanderthal population may have persisted in rare cases, during cold episodes. Alternatively, this might just represent a winter occupation, during a warm episode. In this sense, this part of the model in Britain will have to remain open to different interpretations and therefore in need of further testing.

In the case of Belgium the idea that the area would be inhabited in periods of climatic amelioration and the periods of initial climatic cooling that followed them was vindicated (WFL and TLB sites for warm periods, Trou du Diable for cooler periods). What came as a surprise though was that Belgium seems to have been occupied even in the coldest periods of MIS 3 (Scladina-1A). Originally, my idea of Belgium retaining populations in some parts of cold periods was based on Stewart and Lister's (2001) identification of a Northern refugium in the area. Contrary to their belief that this northern refugium was in no way different from the southern refugia, I hypothesised a difference of degree between these two categories. The actual data from Belgium show that it is very likely that I am wrong and they are right. Of course this can be further tested in the future, if my climatic model is applied in more case studies from the area. There is always the possibility that the case of Scladina is a unique example, where Neanderthals survived longer than usual in this area.

In the case of South-Western France, my hypothesis was that this area was occupied in all periods of MIS 3, and that the population increased in colder periods. The sequence of climatic events from Le Moustier seems to support such a hypothesis. There, Neanderthal presence persists despite the changes from cooler to warmer climate and the opposite as is seen in layer G; in layer H intensity of occupation increases with the deterioration of climate. Further evidence for occupation of this area in cold periods is provided by the sites of La Ferrassie and Combe-Capelle Bas.

6.2. Western European Neanderthals at the synchronic level: landscape use and site function.

In the second part of chapter 2 an ecological/anthropological framework was proposed for analysing Neanderthal occupation of Western Europe at a synchronic level. The basics of this occupation were outlined in terms of possible Neanderthal group size, range, and time spent in different types of sites. Also, a site typology was proposed as a heuristic device for a better understanding of the Neanderthal archaeological sites, within this ecological and anthropological framework. This included three types of sites: *rest/recreation/observation sites* on high elevation points, *kill/butchery sites* near water sources and *food consumption/resources processing sites* in sheltered sites.

By testing the above framework on the data from the three areas, the following results were produced. In all the sites the occupation seemed to have a largely localised focus. This assertion is based on the fact that most of the materials used were coming from short distances away from the sites. In a few cases, rarely used materials came from further away, like in the case of Combe-Capelle Bas (15 km away) and Pin Hole (30 km away). The use of local materials could possibly indicate a relatively small range for Neanderthals in Western Europe. According to Steele's (1996) model for the calculation of Neanderthal home range, smaller range can be related with smaller group size. It seems that in the case of Western European Neanderthals their group size may often have been towards the lower end of the spectrum predicted by Binford (8 persons). The cases of Pin Hole and Combe-Capelle Bas show that this should not be taken as a rigid rule, and that there was the possibility of variation in group numbers, according to different conditions. Also, it is likely that the transport of these materials that occur in small numbers may have been the result of communication between different groups.

In relation to the time spent in different sites by Neanderthals, it was proposed in chapter 2 that short intermittent occupations of sites would be the rule. This of course is difficult to prove, but the data examined provided indications pointing to that direction. For example, there was not a single assemblage, examined by this author, or studied through the literature review that did not seem to be a palimpsest of many different occupations. In this sense, even large assemblages can only point to many short visits, rather than fewer and longer ones.

In relation to the site typology proposed the following can be said. The types outlined in chapter 2 do not seem to exactly match the evidence from the archaeological sites examined. The *rest/recreation/observation sites* were expected to occur in high elevation and in open air context. In the cases of Scladina-1A in Belgium and La Ferrassie-M2c it became apparent that it is possible for this type of site to occur in sheltered contexts as well. This may be related to the fact that both these occupations are associated with very cold conditions. On the other hand *kill/butchery sites* were the only sites expected to be found in the vicinity of water sources. On the contrary, as it was shown both in the case of the TLB loci in Belgium and Combe-Capelle Bas in South-Western France *rest/recreation/observation sites* can also be associated with water sources. Furthermore, the evidence from the WFL locus in Belgium showed that it might be possible to identify *predation sites*, where Neanderthals may have confronted other carnivores to acquire meat. The results of such confrontations and Neanderthals' hunting attempts may be unclear to us, due to partial information from the bone assemblages. Finally, the cases of Hyaena Den, Trou du Diable, La Ferrassie-M2e and Le Moustier-H, showed that the type of *food/consumption/resources processing sites* may often be combined with other types. In the case of Hyaena Den it was proposed that also butchery and observation of the surrounding area might have occurred. In the case of the other three sites the evidence for butchery was unclear. It was proposed though that at least some observation of the surrounding area from the hills above the sites might have occurred. This latter observation points out the significance that caves, located at the bottom of limestone hills might have in the course of Neanderthal daily life.

The approach used in this thesis for the analysis of Neanderthal archaeological assemblages always took into account all the contextual information for each of the sites studied and did not just focus on the stone tool assemblages. It became more and more apparent as the thesis progressed that this approach is well suited to the type of evidence that we are dealing with in the Middle Palaeolithic. Very often, the characterisation of hominin occupations solely on the basis of one dataset can be confusing. In the case of lithics the situation becomes more complicated, because many times it is impossible to decide if a tool found at a site was intended to be used there or to be transported elsewhere and in general the exact actions that preceded its deposition at a site. The context of lithic assemblages, including the stratigraphy and the other available sets of data (fauna, pollen, etc.) can shed light on this kind of questions.

Furthermore, the use of a qualitative approach where all different aspects of the lithic assemblages were taken into account, regardless of how often they appeared in an assemblage and regardless of received wisdom on which types are more important, seems to have been justified. An example of this is the lithic assemblage from the TLW site in Belgium. A view of this assemblage in a more traditional way would completely ignore the predominance of debitage in it. The study would focus on the presence of retouched tools and characterise the assemblage on the basis of the most common tool type, in this case the scraper. On the contrary, in my own view of this assemblage all aspects are taken into account, including both debitage and retouched tools and even rarer types as the Levallois point fragment become part of the explanation.

Finally, a very interesting pattern that arose in relation to the Neanderthal occupation of North-Western Europe in MIS 3 is the constant association of Neanderthals and hyaenas. In all the sites, regardless of their type it is possible that occupations by Neanderthals and hyaenas succeeded each other, or even co-existed at times. We should expect that at the periods when one of these two species would have managed to claim a space of their own, this claim would have not gone uncontested. In this sense, the presence of many points at Trou du Diable might not be at all coincidental, given that a stash of such weapons might have been useful in an ongoing territorial dispute with hyaenas. On the other hand, there might be a different side to the relations between these two species. We saw in the sites we examined that in some cases it is impossible to discern if a bone assemblage was accumulated by hyaenas or Neanderthals. Maybe this is an indication of how closely these two species worked in acquiring their meat, possibly by scavenging each other's kills.

6.3. The model in the context of Middle Palaeolithic research

This section aims to compare the model proposed in this thesis with other attempts to provide explanatory frameworks for the Middle Palaeolithic of Western Europe. Before any such comparisons are attempted, it is important to highlight the fact that, to date, this is the only approach that has integrated Britain, Belgium and South-Western France, within the same explanatory framework. This was achieved not only by the application of the same methodology in all three regions, but also with the use of a common terminology. The term Late Middle Palaeolithic was used for all three regions, substituting the term Mousterian that was invented to describe archaeology solely in South-Western France.

More specifically, in the case of Britain, this is the first time ever that any detailed modelling of Neanderthal behaviour is attempted. The existing problems with the chronology of the Palaeolithic archaeology in Britain during the Last Glaciation, the stratigraphy of the sites and the sparsity of the archaeology in this period seem to have acted for many years as a deterrent to more elaborate behavioural interpretations. It is my view that the work undertaken in the last twenty years, in terms of dating, stratigraphic clarifications, and the interpretation of artefact typologies (see chapter 2) has lifted a curtain that separated the British

Late Middle Palaeolithic from the archaeology of the continent in the same period. From Roe's (Roe, 1981) characterisation of the archaeology of this period as the outcome of seasonal visits by groups of hunters to more recent papers on the significance of the Bout-Coupé handaxe (Jacobi and White, 2002) and the possibility that the occupation in Britain was related to the continent (White, 2006), the way was gradually paved for the approach followed in this thesis. My choice of this dataset was also based on my view of the British sites more as an opportunity than a problem. I strongly believe that a fair view of the record is constructed not only through the "flagship" sites, but also through the ones that offer a lower degree of resolution.

The situation in Belgium has not been very different. In this case also, problems with the stratigraphy and the chronology of sites in the Last Glaciation, have not helped to promote approaches similar to the one followed in this thesis. The work done on the Middle Palaeolithic archaeology of this area has largely focused on typo-technological studies of lithic industries and the classification of these industries, according to the typology of Bordes (Ulrix-Closset, 1975, Van Peer, 2001). The precedence of typo-technological interpretations for the sites of this area is also obvious in a previous attempt to interpret the Belgian sites in a climatic/environmental context (Rolland, 2001). Rolland interpreted the Belgian sites of the period as examples of occupation in cold stadials, based on the fact that their lithic assemblages are classified as Quina Mousterian, which in South-Western France is usually found in the cold MIS 4. The dates of the Belgian sites, as we know them today, do not support such an interpretation, although as was shown in chapter 3, it is very likely that occupation occurred in cold periods within MIS 3.

Compared to the first two regions, South-Western France is the richest in terms of archaeology and for this reason it is the place where a wide range of interpretive models has been applied (Bordes, 1961b, Binford and Binford, 1969, Mellars, 1969, Geneste, 1985, Dibble, 1987, Feblot-Augustin, 1993, Soressi, 2002), each one with a different scope and focus. It was my intension from the beginning to build on all this accumulated knowledge, in order to avoid repeating mistakes of the past and to complement the research already done in this area to the extent that this was possible.

Aiming at this direction, I abandoned the classification of lithic assemblages, on the basis of statistical dominance of different tool types, as it was devised by Bordes. I did this for two reasons. The first is that, in my view, this approach has proved problematic in the sense that it ignores variability beyond retouched tools and it carries the implication that each of these statistically defined variants comes with a fixed meaning, irrespective of its context. The second is related to a side-effect of the discussion generated on the chronological position of these variants; this is that studies on synchronic variability in South-Western France are usually conducted on assemblages of the same Mousterian variant. To counteract the first problem I described the assemblages from the area, using the information from all the lithics in each one of them; subsequently this information was interpreted in conjunction with all the other datasets from the same context. To counteract the second problem, I approached the chronology issue solely on the basis of absolute dates and their correlation with the NGRIP climatic curve. My approach was vindicated in both aspects. In the site of La Ferrassie, it was shown that assemblages belonging to the same variant were likely to represent different types of occupations, based on their context, while MTA, Ferrassie and Typical Mousterian assemblages were all shown to occur within MIS 3 and in generally the same time-frame within this period.

What I consider to be another problem that often occurs in the Middle Palaeolithic research in South-Western France is the lumping of all Middle Palaeolithic sites of the Last Glaciation in the same category. They are all termed Mousterian and comparisons within this category occur in some cases, irrespective of their actual chronology and the climatic/environmental context that goes with it. It was my intention with this thesis to show that there is scope for more time-specific studies in an area which boasts the greatest number of Palaeolithic sites in Western Europe. This was achieved by strictly presenting sites from the first part of MIS 3 and always avoiding comparisons with sites from different periods.

In relation to my model of Neanderthals moving between Britain, Belgium and South-Western France in response to climatic/environmental change, the following observations can be made. The idea of constant abandonment and re-population of North-Western Europe, according to climatic change is not new (Roebrecks and Tuffreau, 1999, Ashton and Lewis, 2002). Neither is the idea of refugia an original contribution of this thesis (Stewart and Lister, 2001, Turq, 1999). What is really new here is the application of these ideas in the specific period of MIS 3, and the attempt to show that these migrations could have occurred in the context of smaller time slices than previously thought. The application of this model in areas like Belgium and Britain is very important for reasons already discussed in the beginning of this section. The focus on MIS 3 is also significant, given that previous studies placed their focus on earlier periods, largely ignoring data from this period (Roebreks and Tuffreau, *ibid)*.

Finally, some remarks in relation to my model on Neanderthal site function. This model has to a great extent built on previous attempts to produce similar classification frameworks (Isaac, 1971, Bordes, 1972, Binford, 1982). The main problem with these approaches was that when they were applied to actual data, they proved too rigid to accommodate the actual variability involved (Burke, 2006). I tried to counteract this problem and to make sure that the real variation of the record would not be obscured by the classification used. This was achieved by two means. The first was to allow for the possibility that one archaeological layer could combine two or more types of occupation (e.g. Hyaena Den in Britain). The second was to allow for the possibility that new types would occur in the process of this study (e.g. WFL in Belgium).

In sum, I believe that the type of approach used in this thesis, based on the integration of often neglected data from different regions with a specific time focus and a co-evaluation of different datasets has a lot to offer to Middle Palaeolithic research. This kind of approach was largely missing up to now, and I hope that this attempt will provide an example for more studies of this kind in the future.

6.4. Conclusions

In conclusion, a new theoretical framework was put forward with the purpose to understand Neanderthal occupation in Western Europe, during MIS 3. The first aim was to understand the diachronic movement of Neanderthals between three different areas in this period, in relation to the climatic and environmental context. The second was to understand Neanderthal occupation in each of these areas at a synchronic context and to outline the basic aspects of Neanderthal life in this specific period and in this specific part of the world. To achieve the first aim a model was built based on the most up to date global climatic and environmental data, while for the second a different model was built on the basis of archaeological and ethnographic data. In the case of the ethnographic data both information from modern hunter-gatherers and modern social carnivores was used.

The results from the testing of the first model on specific case studies showed that:

a) Britain was occupied, during warm episodes in MIS 3, while it is impossible at this stage either to accept or deny an occupation during cold periods.
b) Belgium was occupied in all periods of MIS 3, while it is impossible at this stage to decide in which periods it would be more densely populated.
c) South-Western France was occupied during all periods in MIS 3, while there are indications for an increase of population in the coldest periods.

In all the above cases more information provided by the excavation of new sites and new more precise absolute dates could shed light on the issues addressed.

The results from the testing of the second model showed that Neanderthal occupation more often than not was localised and consisted of very small groups. These groups usually exercised high mobility in the limits of their small ranges, occupying sites for very short periods of time. These sites can be divided in the following categories:

a) Rest/recreation/observation sites, which were either open air or sheltered and were situated on tops of hills.
b) Rest/recreation/observation sites, which were open air and situated near water sources.
c) Predation sites, which were open air and situated near water sources.
d) Kill/butchery sites, which were open air and situated near water sources.
e) Food consumption/resources processing sites, found in caves or rock-shelters at the bottom of limestone hills. Due to their partly residential character, these sites could also combine aspects from types a) and d).

In all the above occurrences Neanderthals seem to have been in close contact with hyaenas and it is possible that these two species often competed for food, water and shelter, while they would have confronted each other in an attempt to protect their own. In the same context, the possibility that Neanderthals and hyaenas scavenged each other's kills cannot be ruled out.

Finally, it has become apparent in this thesis that the qualitative study of lithics, their consideration in close association with other datasets from the same sites and the interpretation of hominin behaviour within a climatic/environmental context can provide very useful tools for a deeper understanding of the Middle Palaeolithic.

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